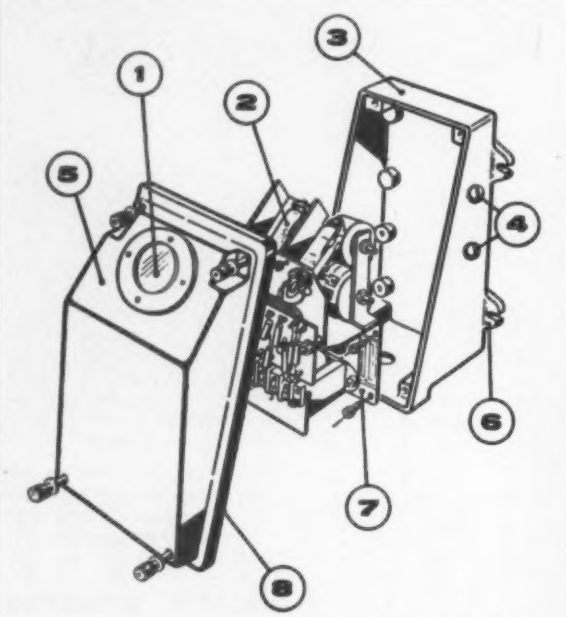
2s. 6d.

Light and *Lighting*

February 1961

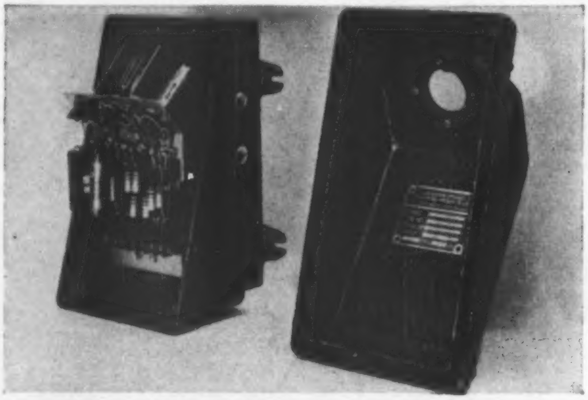
Save your money with automatic lighting control



1 Moulded self-cleaning window
2 Special daylight sensitive photocell
3 Robust cast light alloy case
4 Sealed preset adjustment access
5 Carefully designed viewing angle
6 Substantial mounting arrangements
7 Detachable internal chassis
8 Neoprene long-life seal

Application to a typical installation of forty fluorescent fittings each with two eight foot tubes can save some £18 in one winter–yet the basic automatic lighting control unit costs less than £20

Standard wall mounting case with conduit entry from below—plug-in units are available as optional alternative.



The low cost and high engineering standards of the Automatic Lighting Control Unit Series ALC.3 opens new possibilities in many fields—controlling advertising signs; to make most use of dull days and avoid waste in the sun—controlling yard lighting; for more safety at dusk—controlling shop window lighting; maximum impact at minimum cost—in fact to provide more effective lighting and assured economy wherever artificial illumination is employed.

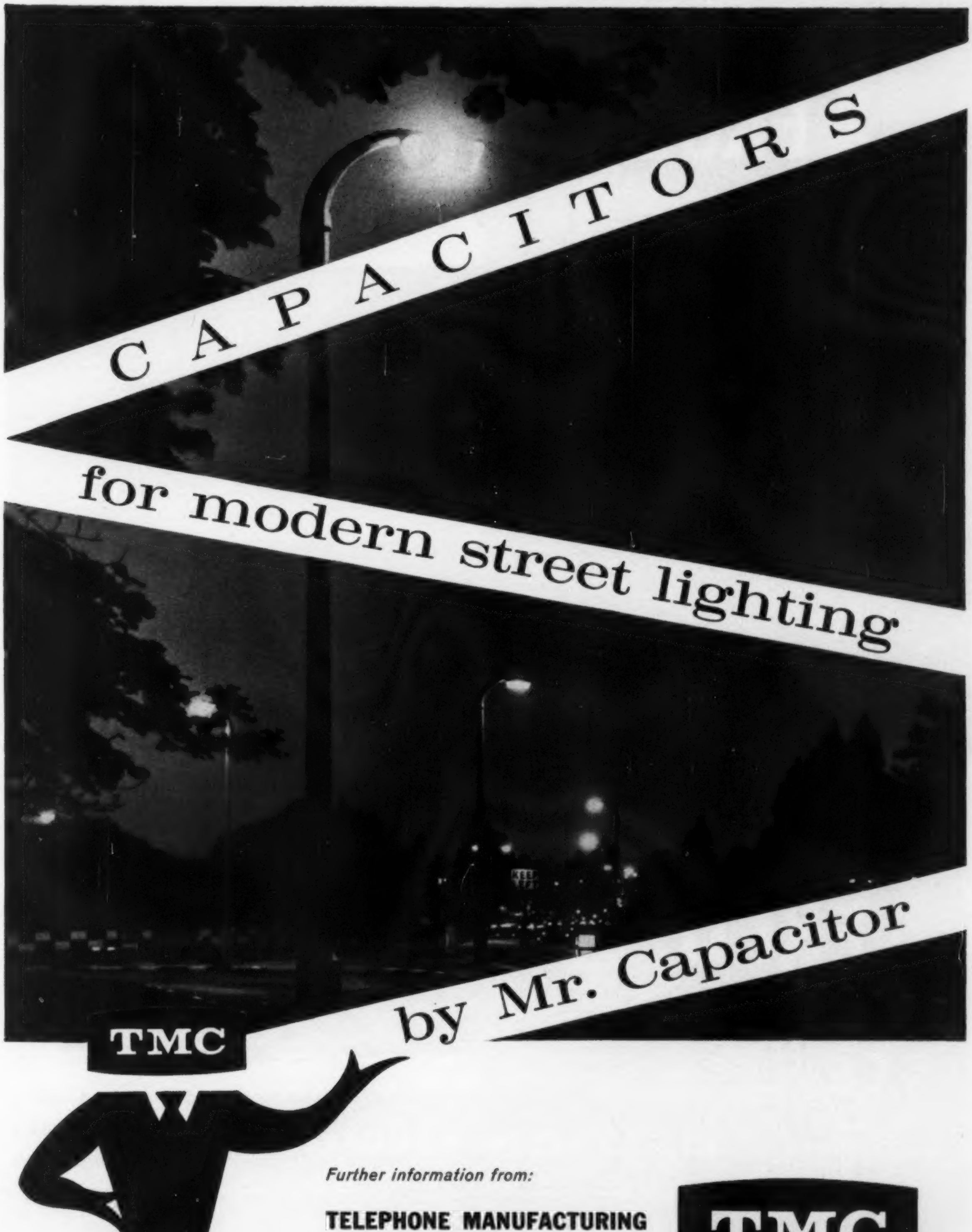
Ask our Standard Products Division for Publication E.1631-01 which gives more details of this money-saving unit.

◀ Removable Neoprene sealed cover provides easy access to interior and users' connections.

LANCASHIRE DYNAMO ELECTRONIC PRODUCTS LIMITED

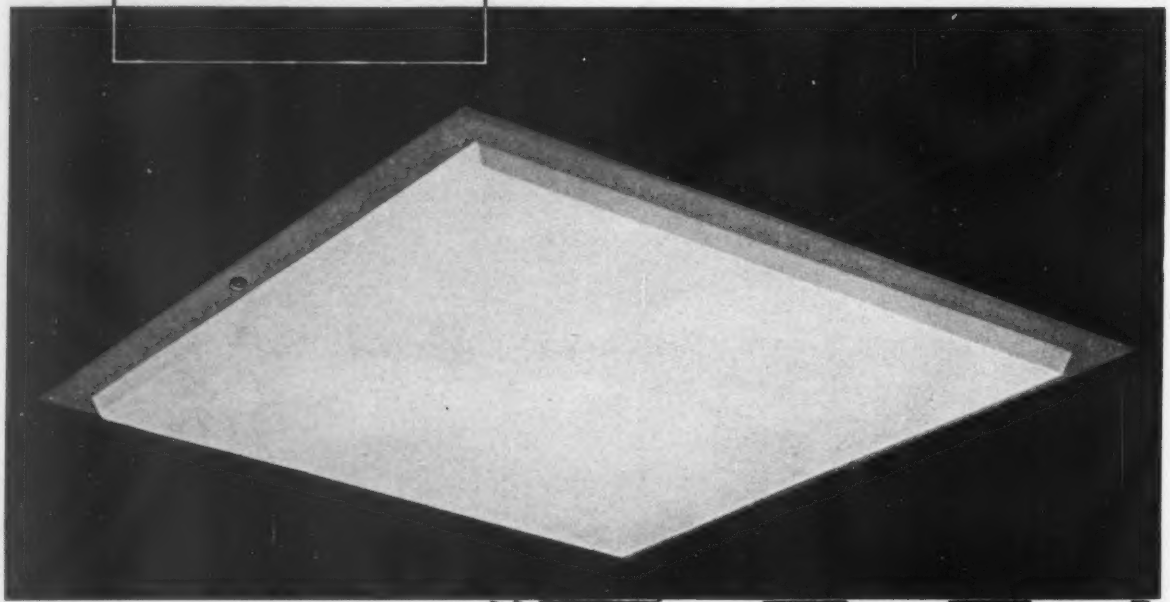
S.P.10 RUGELEY · STAFFORDSHIRE · ENGLAND Metal Industries Group

Manufacturers of the world's widest range of industrial electronic control equipment


CAPACITORS
for modern street lighting
by Mr. Capacitor
TMC

EKCO

MODULAR RECESSED LIGHTING FITTINGS



EKCO

MODULES FOR MODERN LIGHTING

EKCO Modular Fittings are designed for suspended ceilings, providing a quick, adaptable system of Recessed Lighting. Available in 2, 4 and 6 ft units, they combine modern design with maximum efficiency — good looks and good lighting.

EKCO Lighting Engineers are always available to discuss lighting problems and prepare lighting layouts — entirely without obligation.

EKCO-ENSIGN ELECTRIC LTD., 45 ESSEX STREET, STRAND, LONDON, W.C.2. TEL: CITY 8951

SALES OFFICES, ILLUMINATING ENGINEERING DEPTS., SHOWROOMS AND DEPOTS IN

LONDON · MANCHESTER · BIRMINGHAM · NOTTINGHAM · GLASGOW · CARDIFF

EL67

EKCO-ENSIGN "ESSEX RANGE"

This range of lighting fittings is produced in Opal 030 Extruded Diakon, $\frac{1}{4}''$ fluted internally and available in 4ft, 5ft and 8ft lengths. Made to customer's design by Wokingham Plastics Ltd.

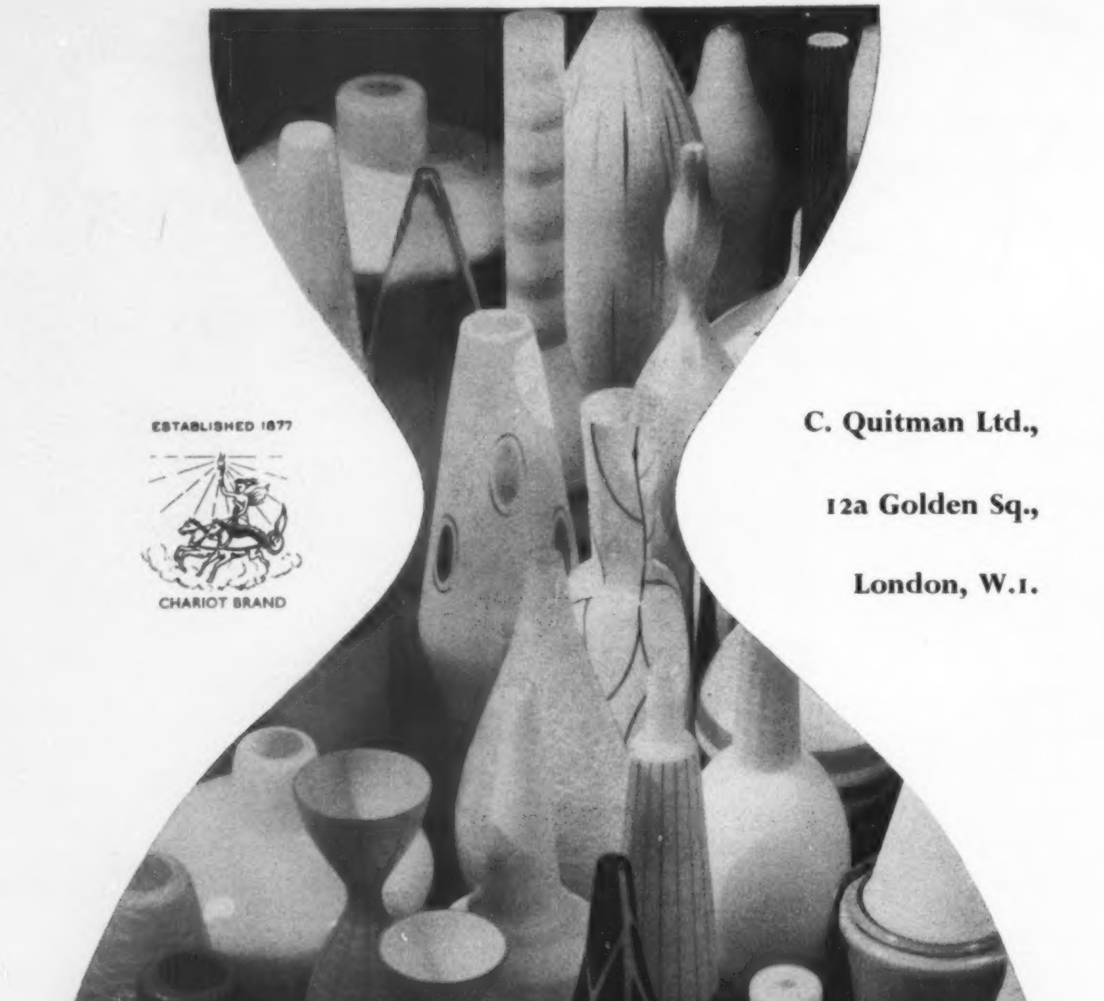
'LOZENGE'

'OBLONG LOUVRED'

WOKINGHAM PLASTICS LTD

DENTON RD. WOKINGHAM BERKSHIRE

Telephone: WOKINGHAM 700/701 A.I.D. and A.R.B. Approved



COULDN'T TRACK DOWN ANY OTHER FLUORESCENT LAMPS WITH ALL THESE FIVE ADVANTAGES

You can search high and low but, wherever you look, you'll always find it's only Philips who offer fluorescent lamps with all five of these major advantages. So, for fluorescent that's far, far ahead, specify Philips!

1 De luxe lamps with double phosphor coating—Colour 32, the established choice for superb lighting of food; and the new Colour 34 for lighting clothes. Specify double-coated—they cost no more than single-coated de luxe.

2 Grain-size selected phosphors for maximum lumen output. Ultra-modern machinery mills phosphor particles to the optimum size, rejects any that are not right. Hence the top luminous efficiency, maintained throughout the life of the lamp.

3 A special binder guards the electrode emissive coating and, together with high purity fill gases, ensures life that is getting longer and longer.

4 All standard lamps above have *both* silicone coating *and* earthing strip. 'Belt and braces' technique gives sure starting, means one stock type only for each and every fitting.

5 Fully closed anode ring (80W 5 ft.) reduces end-blackening and extends electrode life.

Once again

PHILIPS LEAD THE WORLD IN LIGHTING

PHILIPS ELECTRICAL LTD · LAMP & LIGHTING GROUP · CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON WC2

(LD3301)

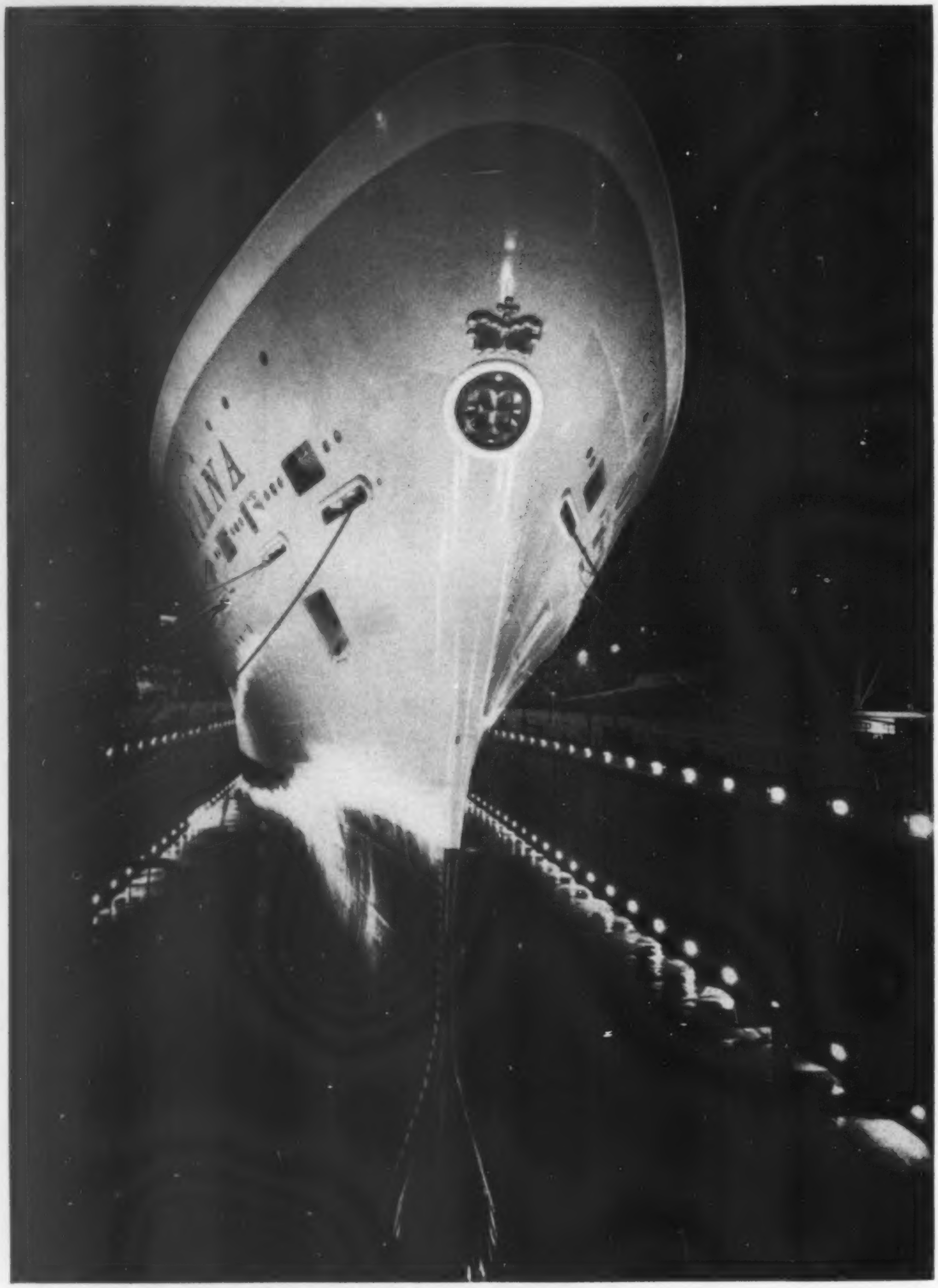
Light and Lighting

CONTENTS

Published by the Illuminating Engineering Society at 32 Victoria Street, London, SW1 (ABBey 7553). Printed in England by the Shenval Press, Simson Shand Ltd, London, Hertford & Harlow.

To travel hopefully....

Whether by choice or necessity, whether enjoyed or not, a great deal of time these days is taken up by travelling in one form or another. Almost without exception every reader of this journal spends some part of his or her working day travelling from A to B simply in order to earn a living; the more fortunate ones make only relative short journeys whilst others spend so long on road or rail that they even start work feeling tired. Longer journeys, undertaken for business or pleasure, are now so commonplace that air- and sea-port terminals are almost as much a part of our daily lives as railway stations. The safety of travel is generally taken for granted, and comfort expected, or at worst hoped for; both are matters with which the lighting engineer is closely concerned and the success of his efforts can do much to ensure that one travels hopefully and arrives safely. In this issue we describe the lighting in the latest addition to this country's fleet of passenger liners and in its home port terminal building. Even in this jet age, there is something about a noble ship which appeals to every one and though the problems they pose challenge the ingenuity of the lighting engineer it would be a sad thing if there were no more liners to light. Similarly, there must be few not still fascinated by railways and before long we hope to bring you a review of the role of lighting in the railway system of this country.



S.S. 'Oriana' floodlit in dry dock at Falmouth, a view which shows off her graceful lines. How she normally appears to the public is seen in the picture on the top of the opposite page, taken during her trials. Her interior lighting, and the requirements to which it was designed, is described in the following article.

S.S. 'Oriana'

Insurance value: £15,000,000
Length, overall: 804 ft
Length, between perpendiculars: 740 ft
Beam, moulded: 97 ft
Beam, extreme: 100 ft
Load draught: 31 ft 6 in.
Gross weight: 41,923 long tons
Propulsion: Double-reduction turbine developing 65,000 h.p. at the shaft service speed of 147 r.p.m. and 80,000 h.p. at the shaft maximum speed of 158 r.p.m.
Service speed: 27½ knots
Trial speed: 30 knots (approx.)
Main screw thrust: 160 tons on each of two
Manoeuvring screw thrust: 10 tons at each end
Fuel consumption: 415 tons/day, for all purposes
Generators: four at 220V d.c., 7,000 kW total; three at 230V a.c. three-phase, 750 kW total; two at 220V d.c., 400 kW total, for emergency use
Cabling: 350 miles
Lighting fittings: 10,000 in cabins, 5,000 in public rooms
Socket-outlets: 2,000 in cabins, 500 in public rooms
Telephones: 700
Bell pushes: 500
Air conditioning plant: 22 million BTU/hr
Evaporating plant: 650 tons/day of fresh water
First-class accommodation: 344 cabins, 688 passengers
Tourist-class accommodation: 513 cabins, 1,496 passengers
First-class restaurant: 369 capacity
Tourist-class restaurant: 784 capacity
Grill: 50 capacity
Cinema: 318 capacity
Crew: 899 (deck 115, engine room 62, catering 722)
Officers: 83
Leading hands: 139
Ratings: 677

ONE OF THE PRIOR AIMS of a passenger shipping line in serving its passengers is to ensure that they acquire and retain a sense of well-being whilst in passage. To this end, both private and public accommodation on board is designed to create an atmosphere which is primarily comfortable with a not too prominent aura of luxury yet which on certain occasions can be stimulating.

That these aims are successfully realized on the P and O Orient Line's new ship, S.S. *Oriana*, is a tribute to the architectural team assembled to undertake her design. The immediate impression is of modern comfort and of generally bright airy interiors, although some of the rooms have a suggestion of heaviness. The individualistic contributions of each designer have in common the co-ordinating influence of the Design Research Unit who had overall responsibility for the public rooms and who employed Derek Phillips as lighting consultant working in conjunction with the architects involved.

Planning the lighting installation started with an appraisal of the Line's earlier ships, notably the immediate predecessor, S.S. *Orsova*, to ensure that the result would maintain the tradition established in the line but would benefit by avoiding earlier weaknesses. It was the aim of the owners to achieve a lighted atmosphere sufficiently varied by the creation of bright pools of light and dark corners to eliminate any suggestion of monotony, and to which both discharge and incandescent light sources would make their distinctive contributions. The lighting was also required to assist the décor in suggesting spaciousness, particularly in view of ceiling heights being generally low in comparison to other room dimensions resulting from the inclusion of an additional deck in the superstructure, made possible by the use of aluminium. This specific requirement has been met generally by the adoption of indirect lighting for most of the public rooms, whilst many of the 'fittings' used for general lighting are semi-indirect in character.

Another major problem to be overcome was to reconcile the seemingly incompatible requirements of adequately bright interiors with a limited electric power availability, notably of alternating current. This has meant that all filament lighting has had to be operated on direct current, together with some of the general purpose fluorescent lighting and all emergency fluorescent lighting (for which special units, suitably marked, have been constructed). Careful planning of lighting circuits had to be made, therefore, to ensure that fluorescent lighting could be provided on a.c. wherever possible in all public rooms, and that d.c. circuits were kept to less prominent areas.

The aim of a generally high level of illumination had to be reconciled with the need to minimize ventilating plant requirements. This posed a particularly difficult problem, requiring detailed studies to determine the acceptable total lighting load and its distribution. After extensive reviews of plans for both lighting and ventilation, it was decided that the average lighting load throughout the ship should not exceed $1 \cdot 5 w/ft^2$ of floor area, although local variations of this figure up to $3 w/ft^2$ could be allowed.

The generally low ceiling heights of public rooms also posed an engineering, as distinct from a lighting, problem in view of the restricted plenum space available for

mounting equipment. For this reason, and also to simplify the actual installation work, it was decided to employ standardized fluorescent lighting units, comprising a control gear box and lamp channel sufficiently narrow to be mounted in pairs on the top of the box, if required.

Ultimately, two basic sizes of box were developed: one housing control gear for one or two lamps with a total dissipation of not more than 40w, the other control gear for one or two lamps of not more than 80w total. The box was made in two lengths for each size, the shorter for use with the lamp (or lamps) mounted on it, the longer for installation remote from the lamps, although remote mounting was avoided wherever possible. Lamp channels could be mounted singly or in pairs on the top, or singly on each side, giving five possible lamp arrangements. Special control gear was developed to give starterless operation from a three-phase supply of 230 V line-to-line, with earthed star point.

Apart from simplifying the installation of the concealed fluorescent lighting, the special box-lamp units also permitted considerable simplification in the use of visible lighting fittings, in that it became possible for the decoration sub-contractors, in a number of instances, to make up and fit suitable light-control devices integral with the interior decoration.

It is implicit in the foregoing that hot-cathode fluorescent lamps have been generally used, rather than cold-cathode lamps, except in one or two instances where conditions showed the latter to be more convenient. Apart from following the owners' previous policy this decision was also dictated by the other considerations mentioned earlier, which required light sources with the highest possible efficiency to be used. On the other hand, de luxe warm white lamps are employed universally, this being the only acceptable lamp colour which

Top, the first class lounge library (Princess Room). The general lighting is from 120 mA cold-cathode lamps concealed in the cornices round the ceiling bays. It is fed through auto-transformer dimmers, to provide means of varying the illumination; the maximum level is 16 lm/ft², but for most purposes it is set at 9/10 lm/ft². Note the semi-recessed filament spot lamps lighting the mural by John Piper. On the left, part of the first class bar (Monkey Bar) adjoining the Princess Room. The main lighting is by the standard box-lamp units referred to in the article, the louver frames being fitted by the decoration sub-contractor. Wall brackets are of wood, made specially for the purpose.

was available at the time of decision.

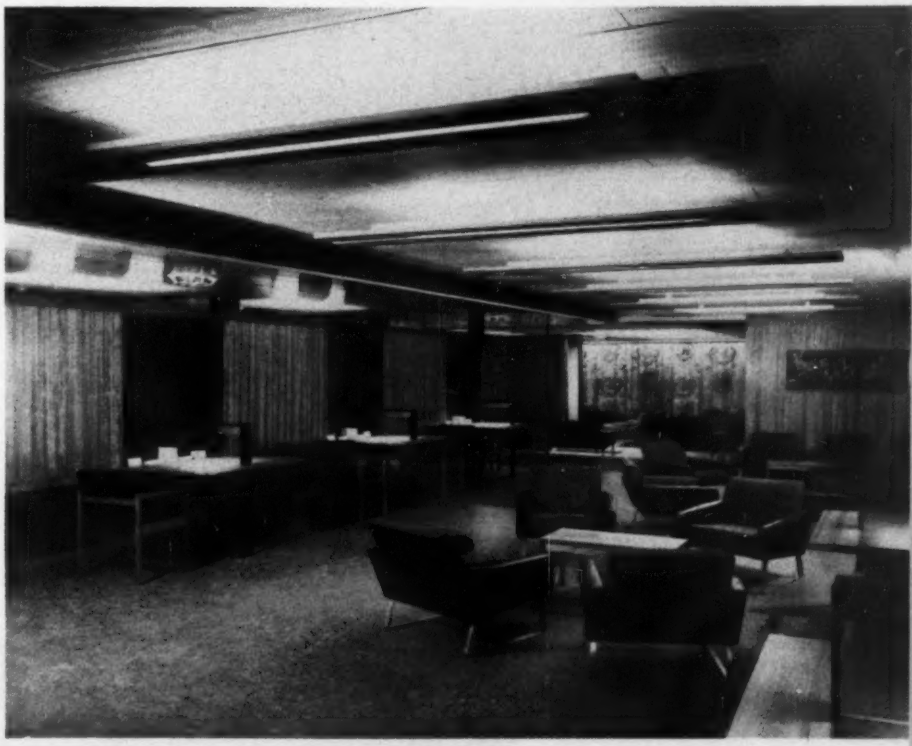
To set out a detailed description of all the lighting in individual areas is impossible in the space available, but closer consideration of the design in specific areas provides examples of the way the general terms of reference set out above have been implemented in practice.

Of particular interest are the main restaurants. Unlike most of the public rooms, which are situated in the superstructure, the restaurants are situated on E deck, in the body of the ship. Both restaurants traverse the full width of the ship, with the first class area forward, and the tourist class area aft, of a central galley which serves both.

The first class restaurant provides a good example of lighting being used to promote a sense of well-being appropriate to the time of day. In its plan, the restaurant subdivides into three distinct areas; there is an approximately square central area, flanked on each side by two smaller rectangular areas, of which the outboard pair are bounded by the ship's side and look out over the sea. All areas are lighted indirectly by hot-cathode lamps concealed in cornices round each area. It was desired, however, to create a bright and slightly stimulating atmosphere for breakfast and lunch, since those times would normally be associated with bright exteriors, and a subdued and more relaxing atmosphere during the evening compatible with darkness outside.

The effects have been achieved by using two lighting systems within the cornices of the two inner areas. In cross-section the cornices take the shape of an L, with the leg of the letter comprising the upstand which rises to the ceiling. Mounted on the foot of the L are two rows of lamps. The outer row (adjacent to the upstand) are screened in the upward direction by a short horizontal metal strip whose width is arranged to give a cut-off to the ceiling thus

Above, the tourist class bar, adjoining the assembly room. As in the Monkey Bar, the lighting makes use of the 'standard' units, with the control gear box concealed within the casing projecting from the ceiling and the lamp concealed by the louver frame, both supplied and fitted as part of the decorative work.



Right, part of the tourist class lounge-library, showing the use of different ceiling heights, in combination with different lighting methods, to create separate areas. The semi-indirect suspended 'fittings' were made up specially using the standard lighting units, with control gear boxes housed remotely in the ceiling over.

preventing light from the lamp below it falling on to the upstand. The inner row is concealed from direct view by a short upright strip carried on the front of the cornice.

During the day, both rows of lamps are alight, to give a bright atmosphere in the central area and in the inboard side areas, to match the bright atmosphere in the outboard side areas created by the natural lighting from the windows. At night, the inner rows of lamps are extinguished, so that all areas are lit by single rows of lamps in the cornices; the subdued atmosphere is further enhanced by the cornice upstands now being in shadow.

Since the night-time lighting was also required to suggest warmth, de luxe warm-white lamps are used throughout to maintain colour harmony during the day. With the metal screen shadowing the upstand, it was found possible (from studies carried out at the GEC Lighting Research Laboratories) to mount the outer row of lamps end-to-end without creating dark patches between adjacent lamps; lamps in the inner row, however, were overlapped by at least 4 in.

In the tourist class restaurant, the problem was rather different and was part of the more fundamental design problem of trying to decorate an interior divided un-

Top, the first class ballroom. The central area is lit from a peripheral cove, housing 40w lamps on standard boxes. The dark transverse bands are gilded, which reduces the overall illumination, but improves uniformity of ceiling brightness. Left, the Red Carpet Room, used for small assemblies, concerts, etc. The peripheral cove is double, with lighting both of the ceiling and of the walls

Right, the tourist class assembly room; the ceiling domes are lit by peripheral cold cathode lamps, on a dimmer circuit. The ring of filament lamps encircling each dome provides permanent decorative lighting. Above, detail of Atlas wall bracket in hand-wrought glass used in the assembly room.

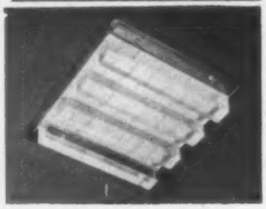
avoidably into areas by the intrusion of functional parts of the ship. The restaurant has rising up through its area part of the boiler plant (eventually leading to the smoke stack) and part of the engine room, which divide the space into three sections: a central area between and on each side of these two casings, smaller side areas outboard of the central area and an athwartships area aft.

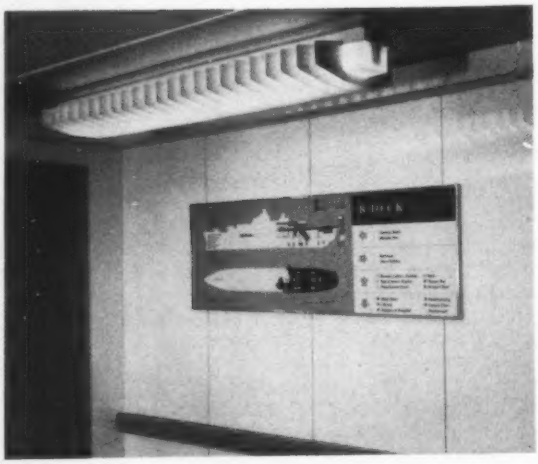
The lighting was required to accentuate rather than conceal these divisions, by changing both the method of lighting, and the illumination levels, in each. The athwartships area is lighted by means of recessed troughs running fore and aft across the ceiling, housing four 4-ft tubes and one 18 in. tube, and are part enclosed by strips of opal 'Perspex', to give levels of illumination varying from 20 to 25 lm/ft^2. In the central area, lighting is from twin-tube fittings, consisting of a metal frame with slotted sides fitted with a sheet of opal 'Perspex', and which are mounted just off the ceiling to provide some upward lighting. The illumination level here is 10 lm/ft^2. The same fittings are used in the outboard areas, but are mounted in pairs and spaced more closely than in the central area, whilst additional lighting is provided over the window curtains, giving levels from 13 to 15 lm/ft^2.

Top, the central area of the first class restaurant, showing the cornice lighting and supplementary filament lighting from Orrefors glassware units. The decorative unit (illuminated during the evening) was specially designed by R. Y. Gooden. Centre, and bottom, parts of the tourist class restaurant. Here the supplementary filament lighting is from cylindrical metal and glass fittings.

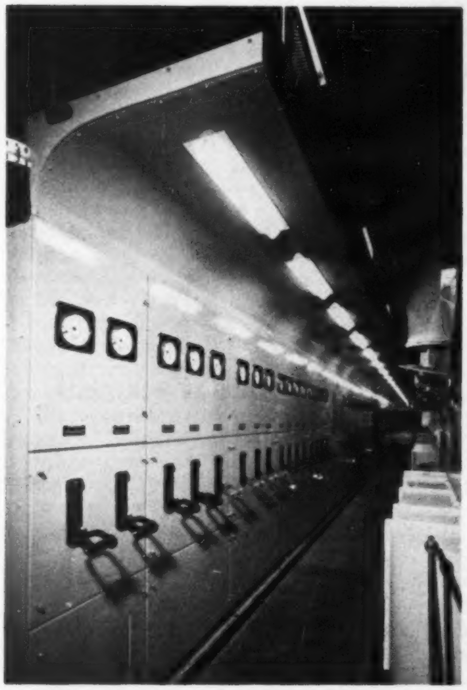
1 | 2 4/5 6 | 3 7

1, View of bedroom in one of the special suites provided on the verandah deck; note the fluorescent mirror lighting. 2, Interior of first class cabin. 3, Interior of tourist class cabin. 4, Detail of wall bracket used in verandah suite. 5, Close-up of machined 'Perspex' block refractor for cabinet lighting. 6, Illuminated deck plan, and louvered fitting used for some of the landings. 7, Entrance to first class shop. The ceiling fittings, designed by DRU, comprise a single opal 'Perspex' strip concealing a fluorescent lamp on a standard lighting unit; the show-case fitting is detailed in 5.

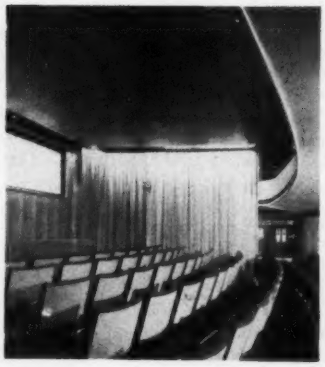


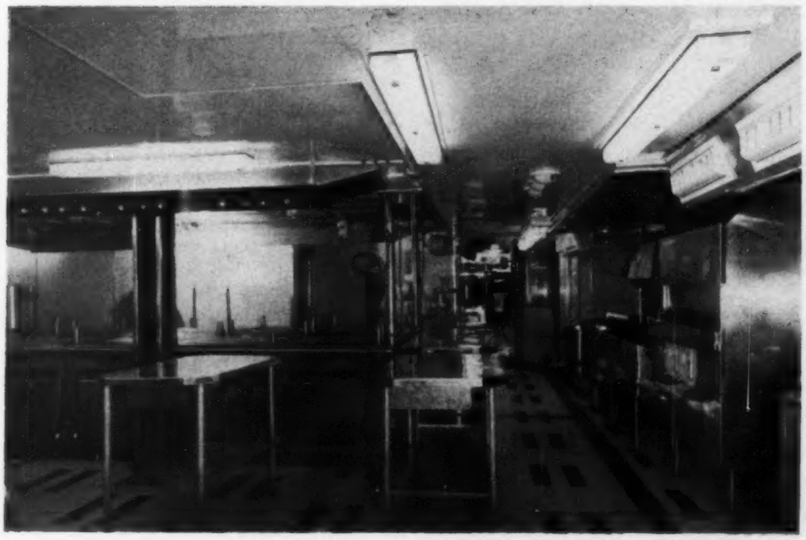


Right, one of the table-tennis rooms. Lighting is from hot-cathode fluorescent lamps (4, 40w per fitting) to a level of 20 lm/ft², with louvers finished black matt to eliminate reflected glare. Below, two of the more utilitarian areas: the main switchboard, illuminated from a canopy with catwalk over and part of the main galley, using sealed, food-factory fittings, positioned over main working areas.



Below, the front of the cinema auditorium. Cold-cathode lighting runs round three sides of the front ceiling area, and is screened by deep cross-louvers.





Acknowledgments

THANKS ARE GIVEN to Derek Phillips and to the Marine Department of the General Electric Co Ltd for assistance in the preparation of the article and to the DRU and GEC for illustrations.

Owners
Orient Steam Navigation Co Ltd.

Owners' Naval Architect
C. F. Morris.

Builders
Vickers-Armstrong (Shipbuilders) Ltd.

Builders' Naval Architects
Austin Kelly.
R. V. Turner.

Interior Design, Public Rooms
Co-ordination: Design Research Unit.
Consultant: Brian O'Rorke.
Execution: Design Research Unit.
Brian O'Rorke.
Ward and Austin.
R. D. Russell and Partners
Lighting: Derek Phillips.

Interior Design, Cabins
R. D. Russell and Partners.

Lighting equipment
General Electric Co Ltd (main suppliers).
A.E.I. Lamp and Lighting Co Ltd.
Atlas Lighting Ltd.
T. Francis and Sons Ltd (searchlights)
Heyes and Co Ltd.
Wm. McGeoch and Co Ltd.
Z Electric Lamps and Supplies Ltd.

Left, main passenger reception hall at the new Oriana terminal building at Southampton, showing the type of general lighting provided and the concealed lighting each side of the suspended ceiling. Below it are two close-up views of (top) the buffet bar, indicating the dual purpose lighting trough and (bottom) one group of telephone booths.

Oriana's new terminal

Quayside building at Southampton Docks specially designed to handle more than 2,000 passengers

HANDLING THE TWO THOUSAND OR MORE passengers embarking on or disembarking from the new liner S.S. *Oriana* is a major undertaking and to cater for this special need (and also for S.S. *Canberra* when she comes into service), a new terminal building has been built at berths 105/6 at Southampton New Docks. The new building is situated midway between the existing passenger-cargo sheds at the berths, replacing a smaller passenger hall built when the New Docks were opened. It has a frontage of 196 ft and a depth of 102 ft; accommodation comprises a large central reception hall on the ground floor measuring 114 ft by 100 ft, shipping and customs offices at mezzanine level and a balcony and covered enclosure at the top level facing the quayside for visitors meeting or seeing passengers away. The reception hall connects with the customs examination areas in the adjoining sheds where the boat train platforms and road vehicle bays are situated. There are two vestibules, one on each side of the hall, and which also connect with the customs area, to serve as immigration halls.

The general decor of the waiting hall has been designed to give a warm welcome to passengers, enabling them to relax in an atmosphere of comfort whilst awaiting the formalities of embarkation or disembarkation. Walls are decorated in the contemporary style with wood panels and vertical strips of Siamese teak with contrasting panels in p.v.c. and stone. The entrance from the quayside is framed in Derrybdene marble and is surmounted by an abstract mural, designed and executed jointly by R. A. Sullock and R. D. King. Amenities for passengers include a buffet, writing desks, currency exchange, bookstall, railway booking office and telephones. The buffet is panelled in rosewood veneers, to contrast with the surrounding wall areas. Bookstall, railway booking office and currency exchange stands are housed in an island platform in the body of the hall, and the shipping company's stands are along the north wall.

The general lighting of the passenger hall is provided by four rows of square fluorescent fittings with diffusing panels of opal 'Perspex', semi-recessed into the suspended ceiling. The fittings, specially

constructed by Harris and Sheldon for this installation, house six 4 ft white lamps to give a level of illumination of 15 to 20 lm/ft². It is supplemented by 'Ion-lite' cold-cathode tubing, concealed along the longer sides of the ceiling to illuminate the wall area above the shipping company's stands on one side and to illuminate the mural on the other. As can be seen, the mural lighting has, in fact, a double cornice, one row of lamps being installed along the edge of the ceiling proper and a second row along the edge of an intermediate canopy of red cedar. In the soffits of the ceilings over the side areas below the mural, specially-made recessed filament fittings are used, employing 100w internal-reflector flood lamps.

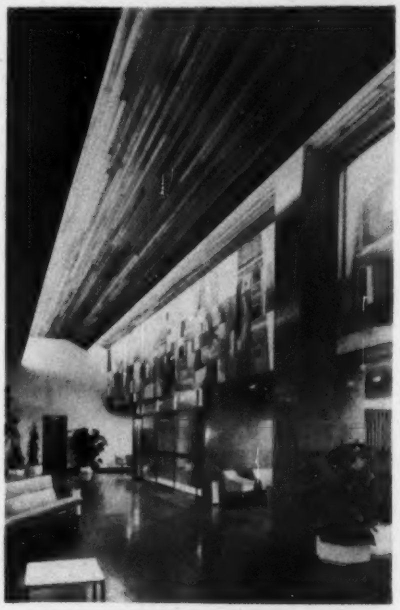
The buffet lighting is also of interest. Above the bar has been suspended a trough which has two functions: to house not only the lamps for lighting the bar but also the metal screen which is lowered when the bar is closed. There are two rows of fluorescent lamps associated with the trough. One row is housed within it to give downlighting on to the bar surface; the other is mounted on the rear surface to light the area behind the bar. There is a further row of lamps suspended halfway between the trough and the rear wall at trough level to light the rear wall; they are fitted with a continuous parabolic reflector to screen them from direct view.

The immigration halls off the main passenger hall have contrasting lighting, in the form of transverse runs of fluorescent lamps recessed into the ceiling. They are housed in Lumitron trough units specially adapted for this use.

The island sites, having open roofs, obtain their main lighting from the ceiling lighting for the hall in general. The bookstall lighting, however, is supplemented by two Allom Heffer 'Perspex' pendants. Along the front 'pelmet' of each stand, clear 'Perspex' panels have been fitted, on which have been engraved the appropriate description. The panels are then edge lit from below by means of fluorescent tubes concealed within the pelmet structure and placed close up to the lower edge of the panel. Over the shipping company's stands, supplementary lighting is by semi-recessed filament reflectors using small-bulb lamps, housed in the ceiling below the mezzanine offices. Booths are lighted by means of bare 3 ft, 30w fluorescent lamps mounted just over the door. To complete the lighting of the passenger hall is an illuminated feature, described as a statuesque lighting column, made from 'Rotaflex' plastics spinnings and rising from floor to ceiling in a small waiting area at the side of the hall.

From the architectural point of view, the building exterior is also of interest, in that barrel-vault roofing gives a scalloped edge to the outline, in marked contrast to the other frontages along the New Docks quay. Each of the three levels is stepped towards the quay, accentuating the horizontal lines of the building. The exterior face at ground floor level is in slate-green reconstructed stone with Portland stone dressings to window and door surrounds, the main walling consisting of glass blocks with inset picture windows. The first floor is faced in mottled black, with polished cedar wood at the extreme ends; the visitors' viewing balcony above is a glass fronted enclosure with an aluminium balustrade and decorative bronze handrail.

Architect: E. C. W. B. Dromgoole, FRIBA (BTC).
Main Contractor: A. Monk and Co Ltd.
Electrical Installation: BTC (Docks Division) Electrical Dept.
Interior Designers: Heal's Contracts Ltd.



Right, the immigration control hall off the main reception area with recessed trough lighting. Above are views of the special illuminated 'statuesque' and of the double cornice arrangement for lighting the mural.

BOAC, Victoria

Modernization of and extensions to BOAC's air station at Victoria. Architects, T. P. Bennett & Son; interior design, Beverley Pick Associates; lighting installation, Drake & Gorham (Contractors) Ltd; lighting fittings, The General Electric Co Ltd, Courtney, Pope (Electrical) Ltd.

THE VICTORIA AIR STATION was built in 1938 for Imperial Airways Services to the Commonwealth and its *décor* featured the extensive use of 'Empire' hardwoods—nearly all the walls, as well as the massive, fluted columns, being faced with contrasting wood veneers. In 1940 the station was taken over by BOAC, and today over half a million passengers pass through the building each year. The new extensions are designed to cater for this vast increase in traffic, as well as providing *décor* and amenities in keeping with those found in air stations more recently constructed.

In its original form, the air station comprised a large concourse, entry to which was in the centre of one long side, with a serpentine bar at one end and a restaurant in the basement. Along the side of the concourse facing the entrance were the counter, with mezzanine offices above, and a substantial part of the concourse area was occupied by extremely solid-looking seating, which was fixed to the floor. General lighting was from two rows of opal-glass spheres suspended from the coffered ceiling, giving illumination which, by today's standards, was inadequate both in quality and quantity. When the premises were modernized in 1958, this lighting scheme was not changed, though tungsten fittings in the mezzanine offices were replaced by fluorescent units with egg-crate louvers.

The extension to the air station comprises a seven-storey building, the ground floor of which is occupied by coach bays, with six floors of offices above for BOAC and other airlines. The old building was completely gutted and the ground floor replanned to serve literally as a concourse and circulation area. Mezzanine balconies were inserted at either end, linking up with the existing mezzanine over the rear portion of the concourse, the balcony over the south part of the building being extended into the new block. These mezzanine areas provide seating accommodation and a buffet/bar, all offices having been transferred to the new office building; while there is a new restaurant and an additional bar in the basement of this new building, the old restaurant now serving as a staff cafeteria.

Lighting of the central area of the concourse is now provided by rows of specially-designed fittings intended originally to house two tungsten lamps but now housing a colour-corrected mercury lamp. These fittings, which are fixed directly to the new false ceiling, comprise a dished reflector, stove-enamelled white and decorated with radial strips of satin-silver anodized aluminium, and a suspended spinning concealing the lamp. The soffit of this spinning is fitted with a cover, the centre portion of which is of opal glass, while the metal periphery is perforated.

Standard fittings

Elsewhere, at ground level, 'standard' tungsten fittings are recessed into the soffit of the mezzanine floor, the fittings having a perforated aluminium skirt and concentric louvers stove-enamelled white. In addition, there are cylindrical opal-glass pendants over the counters, while a row of spotlights is recessed into the ceiling to light the standard BOAC route-map mural, on which the various cities served by the airline are indicated by small low-voltage tungsten lamps. The mezzanine areas, apart from the buffet bar, are lit by a

modified standard fitting for a 100w tungsten lamp. The fitting comprises a suspended drum with decorative piercings, with the flex—varied in length so that, irrespective of ceiling level, all fittings are the same height above floor level—concealed by a black anodized aluminium sleeve.

The buffet bar is lit by specially designed fittings, also suspended so that all are equidistant from the floor, these fittings being intended to create the illusion that the ceiling, which is painted dark blue, is higher than it really is. They comprise a white stove-enamelled plate 2 ft long and 9 in wide, from one end of which is suspended a small box housing a colour-corrected mercury lamp, though originally intended for two small tungsten lamps. The box is made of perforated metal, though it has a sloping end of reeded 'Perspex' facing the long portion of the stove-enamelled plate on to which the light from the mercury-vapour lamp is directed.

The restaurant

Of particular interest is the decorative method of lighting the new restaurant. This area has a three-dimensional ceiling treatment constructed from strips of white-enamelled sheet steel, and at each intersection of the pattern there is a 25w silica-coated round lamp. In addition, tungsten fittings, as used in the peripheral area of the main concourse, are recessed into the peripheral areas of this room; there are opal-glass wall lights, whilst curtains covering the end wall are top-lit by fluorescent lamps. Finally, along the main wall there is a large photographic transparency of a cloudy sky, giving a picture-window effect. This is lit from behind by reflected light from two horizontal rows of fluorescent lamps concealed by two bands of silver-finished sheet steel, the reflector panel being shaped to ensure even 'flashing' of the transparency.

Because of excessive radiant heat from the ceiling lighting, the silica coated lamps are to be replaced by lamps of 15

Opposite page, enquiry desk, direction indicator and standard route map/mural in main hall. The mural is lit by a row of nine adjustable spotlights recessed into the ceiling, towns marked on it being indicated by low-voltage tungsten lamps. Below, general view of main hall looking north towards the arrival bay, compared with (smaller picture) general view of same area (facing opposite direction) before modernization. Large opal-glass pendants have been replaced by rows of ceiling-mounted fittings with white-enamelled reflectors decorated with radial strips of satin-silver anodized aluminium. Above the counters in the background hang cylindrical opal-glass pendants.

instead of 25w, it having been found that the illumination level is unnecessarily high at between 20 and 25 lm/ft^2. (The peripheral and supplementary lighting alone gives about 7 lm/ft^2.)

In the private dining room adjacent to the restaurant there is another 'picture-window' effect, though here there is sufficient space behind the transparency to allow direct, instead of indirect, back-lighting. Fluorescent lamps are, in this instance, mounted on a wall about 2 ft behind the photograph. The ceiling of this room is treated differently from that of the restaurant. It is constructed of fibrous plaster and incorporates rows of fluorescent lamps above diffusing strips of opal glass set flush with the soffit. Between these rows of lamps, the fibrous plaster is pierced with glass-covered holes arranged in a random 'pattern', through which a certain amount of light from the ceiling above percolates.

Comments

An inevitable comment on this lighting installation is that, with the exception of the basement areas, reliance has been placed almost entirely on conventional 'fittings'. In the concourse, in particular, one might have expected some form of luminous ceiling, especially as passengers on the mezzanine balconies see the main fittings almost at eye level. It is understood, however, that complex arrangements of beams would have made a luminous ceiling difficult to install, while the ceiling height precluded, in any case, the use of a luminous ceiling over the entire area. A second criticism is the use of suspended fittings in the buffet bar, with its 7 ft 6 in ceiling height. The reason for the design of these fittings has been explained above, but a better solution might have been the use of deeply-recessed spotlights.

BOAC, VICTORIA continued

Opposite page, top and centre, the circular 'Skyline' bar, with its tent-like ceiling lit by a ring of spotlights recessed into the drum from which the ceiling is suspended. Additional light comes from an H-section ring of sheet steel, with perforated sides, which is suspended from the ceiling by piano wires. It hangs about 2 ft away from the perimeter wall and houses 4 ft fluorescent lamps below its horizontal component, with starting gear above. The bar, lit from above by fluorescent lamps concealed by an 'Infinilite' laylight, has backlighting to the shelves, with pieces of coloured glass glued to the diffusing panel of cast glass to create a decorative pattern. At the foot of the opposite page is seen a showcase for model aircraft lit by fluorescent lamps above a laylight of 'Paragrid Tile'. This page, top, buffet bar on mezzanine balcony, with specially designed fittings intended to create the effect of a false ceiling level so that the true ceiling, which is painted dark blue, seems higher than its actual 7 ft 6 in. Originally designed to house two tungsten lamps, the fittings now hold a colour-corrected mercury lamp. Centre, cloud mural in private dining room is lit from behind by fluorescent lamps, while reflected light from the lamps which form stripes across the ceiling percolates through the random holes in the fibrous-plaster soffit. Bottom, new restaurant, with three-dimensional ceiling treatment of strips of sheet steel, with 25-volt silica-coated tungsten lamps at each intersection of the pattern.

Fig. 1. Exterior view of the new academy, showing the prism-shaped theatre building in the foreground, five-storey accommodation block on the right and exhibition area at left. The tall building also on the left is a block of flats having no connection with the Academy

Berlin's new Academy of Arts

By Arnold Wolfram

THE WORK OF THE YOUNG BERLIN ARCHITECT Werner Duttmann, the new Academy of Arts in West Berlin seems, from a mere description, to have its proper place in the realm of improbability. Its design expresses boldly the personality of the architect and his team of co-workers, such freedom having been made possible by the generosity of a Berlin-born American, Henry R. Reichhold. The result, in the words of a woman journalist, is: 'a factory-like exterior, particularly when viewed from above, concealing a dream-world of art.'

The Academy, which extends over about $3\frac{1}{2}$ acres, is divided into three distinct sections. The low central building, which covers the largest built-on area of the site, contains the exhibition rooms on its upper floor, and these are open to the public. Leading off this building at one corner is the studio-theatre, the prism-shaped structure in the foreground of fig. 1. One of its uses is to be experimental theatre, to which end its construction departs from the conventional in providing a through-stage, open to an auditorium on each side (figs. 6,7). Although uncommon, this type of stage is not novel in its use here; moreover, the acoustic arrangement does not permit the stage to be divided for separate performances to be played to each auditorium. Other uses for the building will be ballet, concerts, film shows, lectures and similar presentations. The third building, which rises through five storeys and is the tallest on the site, contains studios and apartments, to provide both dwelling and working accommodation for guests of the Academy. The principal rooms are planned to permit of considerable experimentation in their use, which has involved extensive provision being made

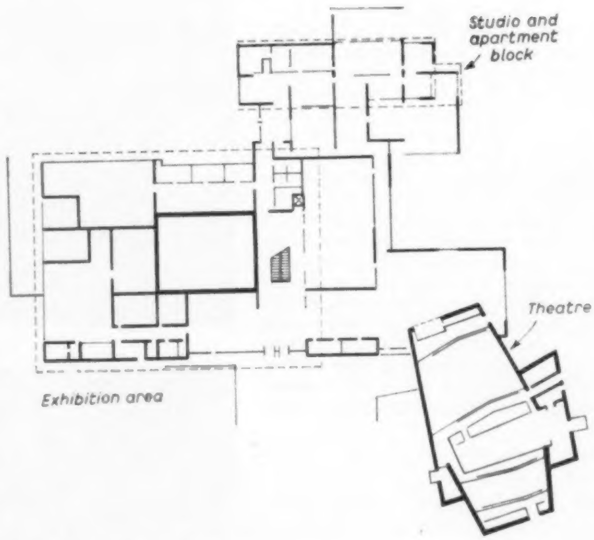


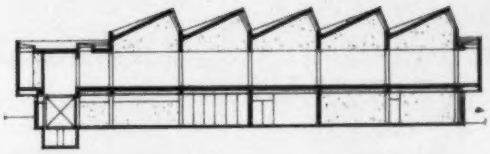
Fig. 2. Ground plan of the Academy, showing clearly the asymmetrical character of the theatre building on the lower right-hand corner.

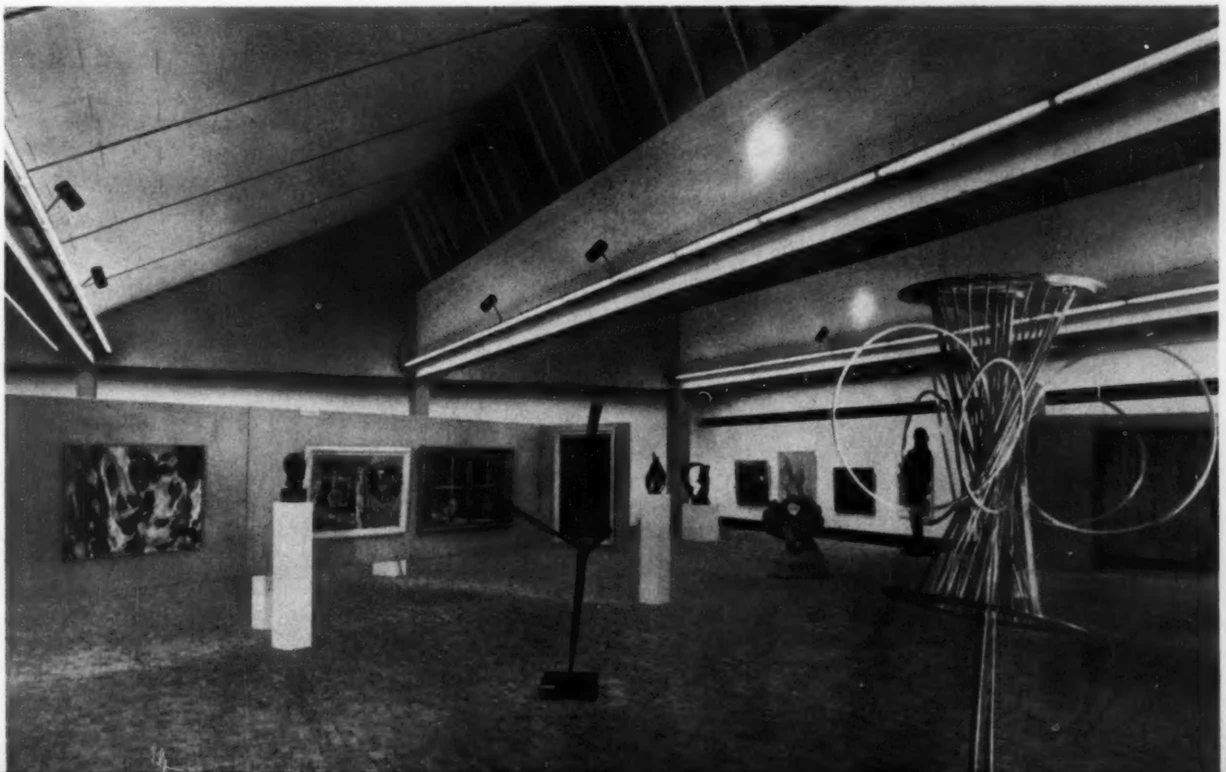
The author is with Siemens-Schuckert, A.G.

Fig. 3 (above). Exhibition room with wood louver ceiling, above which continuous rows of 65w double-coated de luxe warm white fluorescent lamps, giving an average intensity of illumination of 35 lm/ft²

Fig. 4 (right). Section through the exhibition building.

Fig. 5 (below). Exhibition area with 'northlight' roof, showing the continuous fluorescent channelling carrying the adjustable filament lamp cylinder fittings.





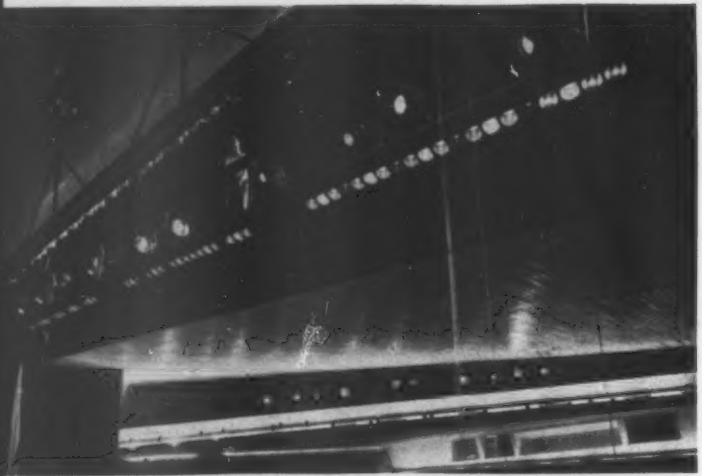


Fig. 6 (top left). View of the larger auditorium from the stage, showing clearly the lighting bridge (characteristic of the German theatre) and some of the stage lighting equipment. Note also the seemingly haphazard arrangement of the auditorium lighting fittings on the edge of the suspended ceiling.
Fig. 7 (bottom left). Looking from one auditorium through the stage to the other. The characteristic asymmetry of the building is clearly indicated.

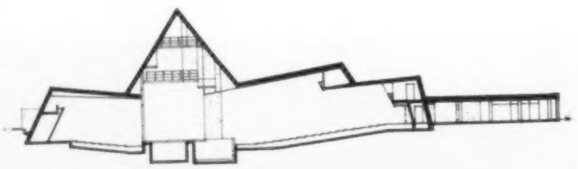
for alterations, both in their structure, and consequently in their lighting.

The largest of the three exhibition rooms (fig. 3) is a long hall with a 'north-light' roof construction; considerable use has been made of concrete and glass, with surface finishes predominantly in grey, white and, to a lesser extent, black. On each side of the beams which support the troughs of the roof, a continuous line of 65 W 'warm-tone de luxe 31' reflector fluorescent lamps* has been installed. The lamps are housed in a continuous run of channel, to the upper side of which are attached brackets carrying black-lacquered cylinders each housing a 150 W internal reflector filament spot lamp. The brackets are designed to allow the cylinder to be swivelled to all sides, and to be moved along the fluorescent channel, thus enabling almost any display in the exhibition to be highlighted at will. The fluorescent lamps are connected in two-lamp circuits supplied from individually-switched socket-outlets sited along the run of channel, so that the lighting may be readily varied in sympathy with the character of successive exhibitions, creating darker ceiling areas and providing greater directional lighting of exhibits, should this be desired. In general, the level of illumination in the exhibition area is approximately 30 lm/ft^2.

The two smaller exhibition rooms are provided with louver ceilings in the form of vertical battens of wood, left in their natural surface finish, above which lines of 65 W 'warm-tone de luxe 32' fluorescent lamps* have been installed. Also concealed within the ceiling are 65 W reflector fluorescent lamps, sited round the periphery of the area to emphasize the wall surfaces.

In the theatre, the stage light is appropriate for the experimental nature of the building; it comprises 45 spot-lighting lanterns, three acting-area lanterns, three compartment battens and a number of mobile lanterns. In the auditorium, it was a deliberate intention of the planning to create non-uniform lighting effected by an arrangement of lighting equipment which is seemingly haphazard but is, in fact, dictated by the characteristic asymmetry of the building, most clearly shown in fig. 7 by the cant of the ceiling edge. There are three lighting troughs, housing 32 g.l.s. filament lamps of 1,000 W each, together with 42 cylindrical luminaires with 150 W internal reflector filament spotlamps irregularly distributed around the auditorium. The ceiling is of wood battens which, by virtue of the room's asymmetry, meet the walls at an angle; the end of each batten has been cut off square, forming a saw-tooth pattern with the adjacent wall surface and this has been given visual emphasis by fluorescent lighting above. In view of the spaciousness of the interior, the consequent wide disparity (from 5 to 30 lm/ft^2) in the illumination intensities over the area is not disturbing.

In this attempt to outline the essential features of the Academy of Arts and its lighting, it may seem that the impression which has been given does not justify what could be regarded as an exaggerated description in the words, 'dream-world of art'. There is no doubt, however, that the Academy ranks among the most outstanding in present-day building.



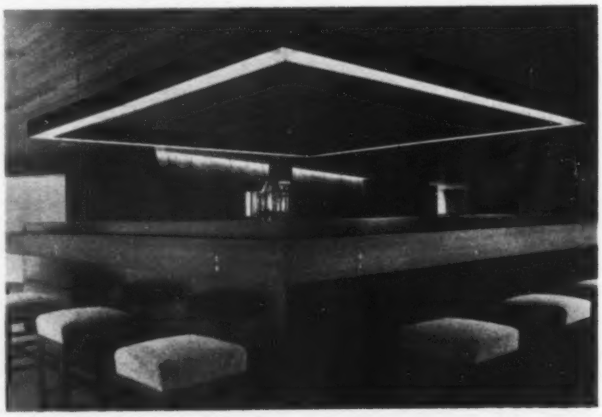


Fig. 8 (upper). Section through the two auditoria and stage.
Fig. 9 (lower). Special lighting over the bar: a frame of fluorescent lamps and plastic louvers.

* These are single-coated lamps largely identical to British de luxe warm-white; their de luxe 32 lamps mentioned later are double-coated, their closest counterparts in this country being Philips' colour 32 lamps.

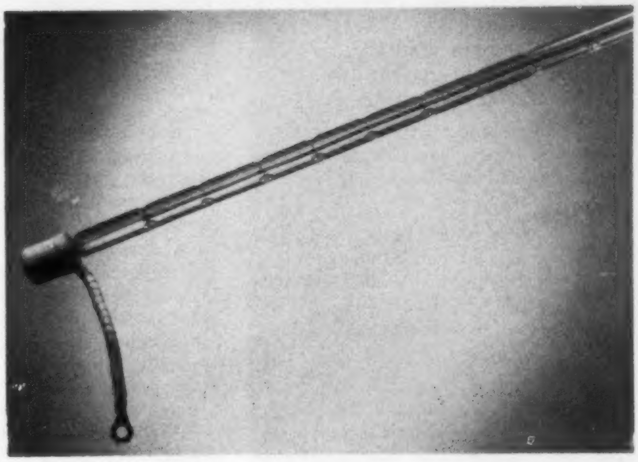


Fig. 1. Infra-red lamp with dimpled tube for vertical burning.

Quartz-tube Line-filament Lamps for Heating and Lighting

By J. R. COATON, Graduate IEE, and S. M. PHILLIPSON, AMIEE

RESEARCH AND DEVELOPMENT usually take place most rapidly when there is a national or commercial need. During the last war, air drying lacquers used for preserving armaments were superseded by synthetic enamels which could be dried and hardened by stoving with great saving in time and factory storage space. To facilitate this process, glass bulb tungsten filament lamps running at a colour temperature of about 2,500°K and having most of their radiant output in the short wave infra-red region were developed. These lamps, each in a gold-plated spun-copper reflector, were mounted in flat banks over the surfaces to be irradiated or formed into tunnels through which the parts to be heated were passed on a conveyor. Later infra-red lamps were made in the form of blown-glass bulbs incorporating aluminized near-parabolic reflectors which gave more accurate control of the radiation, reduced the possible size of the radiator bank and made it easier to clean. Closely spaced arrays of such lamps allowed average radiation intensities up to 10 W/in.^{2} to be attained on the work surface.[1]

More recent development of rockets has stimulated further use of infra-red radiation in the laboratory similation of the heating effects on a rocket nose-cone or other structure when re-entering the earth's atmosphere. Internal-reflector i.r. lamps with their low thermal inertia seemed ideal for reproducing the sudden burst of heat energy at the test surface but the temperature rise obtainable was insufficient. The design limitations of the test rig suggested[2] the use of incandescent line filament lamps with tubular envelopes of quartz, of such dimensions that a large number could be placed side by side around the periphery of the test surface, to raise its temperature by as much as 2,400°C in half a second. (Fig. 2).

The authors are with the A.E.I. Lamp and Lighting Co.

Tubular-quartz line-filament infra-red lamps

Hand-formed molybdenum foil seals had previously been developed for type MB quartz tube mercury vapour discharge lamps. With improved techniques, notably the mechanical pinch sealing of the molybdenum foil and the use of tantalum discs in the dual function of getter and support for the coiled tungsten filaments at the centre of a ⅜ in. diameter quartz tube, it was found possible to make a very compact infra-red lamp as shown in the lower part of Fig. 3(a). The physical characteristics of the two main commercial sizes of these lamps are given in Table 1.

Fig. 3(a) also compares the physical size of the 1,000 w linear heat source with the 250 w internal reflector lamp. The i.r. radiation produced by the tungsten element running at approximately 2,400°K is mainly short-wave but there is a long-wave component from the hot quartz.

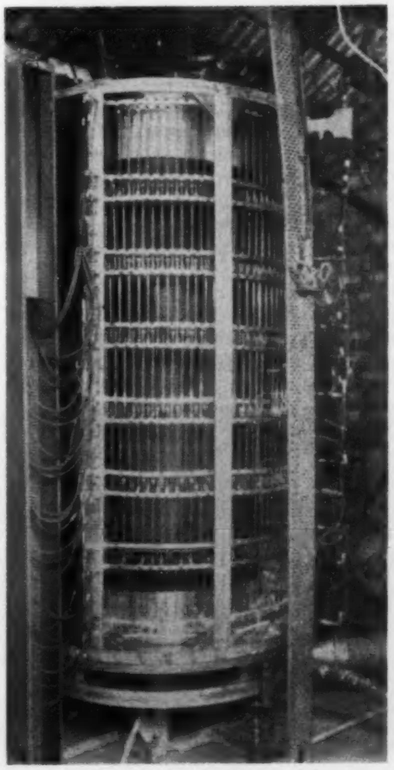


Fig. 2. Bank of quartz-tube infra-red lamps (acknowledgments to Director, Royal Aircraft Establishment)

Lamp manufacture

The essential steps in manufacturing quartz tube infra-red lamps are as follows:

1. The tungsten filament is wound and cut to approximately 1 in. less than the actual lit length, and shaped tantalum disc supports are mounted on the filament.

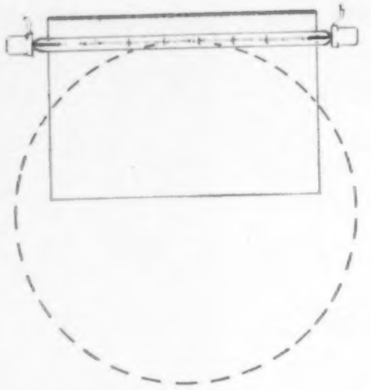
2. Foils are rolled from rectangular molybdenum wire, then furnaced and etched so that the seal portion is 0·0008 in. thick; these are attached to the filament so that each end terminates in a foil.

3. The filament is burnt in an inert atmosphere, and stretched to within $\frac{3}{8}$ in. of the required lit length. The filament and disc assembly is then threaded into its tubular envelope which has an exhaust tube sealed onto it. The filament is tensioned and held at its required length, whilst heat is applied to the ends of the quartz tube, in the region of the thin foil, and finally the gas tight seal at either end of the tube is made by pinching the softened quartz onto the foil.

4. The lamp is evacuated through the exhaust tube, argon filled, and finally sealed off. Suitable caps are attached to the ends, and the lamp is lit whilst being rotated, so that the filament stabilizes without sagging.

In the early days of manufacture, difficulties were experienced in stabilizing the filament to prevent sagging and in accurately positioning the filament in the tube, but present day processing has improved so that the total axial aberration due to sagging and filament positioning is such that the whole filament throughout its lit length can be contained within a cylinder of twice its own diameter; the ratings shown in Table 2 are produced within this close tolerance.

It is now possible, moreover, to make a lamp that can be burnt vertically. This is achieved by securing the tantalum disc supports by a series of dimples in the wall



of the tube (Fig. 1) thus preventing the filament assembly from collapsing whilst burning vertically. Provisional data of the 1,050 w vertical-burning lamp which is at present available are given in Table 3.

Processing techniques are under constant review and the present method of exhausting a lamp by pumping and gas filling is gradually being superseded by merely blowing argon through the open tube containing the filament assembly to displace the air, after which the tube ends are sealed in the normal manner. This new process improves lamp quality and obviates the need for an exhaust tip on the tube.

Such improvements, and the accumulation of experience, have led to a further step forward in the development of the quartz tube infra-red lamp, and in the future, it is hoped that certain types will be made even more compact without any loss in performance.

Quartz lamps as heat sources

The high melting point of quartz has enabled comparatively large wattage loadings to be concentrated in quartz tube lamps of small physical dimensions so that lamps can be spaced more closely to give higher flux distributions. A single 1 kw quartz i.r. lamp in a suitably designed trough reflector will give a flux density of

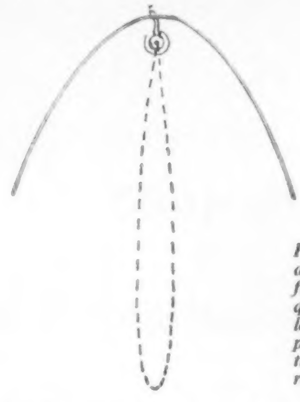


Fig. 4. Light distribution from a quartz-tube lamp in a parabolic trough reflector

50-100 w/in.[2] over a limited area; by using a multiple array of lamps and reflectors it is possible to obtain densities of up to 350 w/in.[2] or about 50 kw/ft.[2] One of the limiting factors is the temperature of the molybdenum seals.

Present lamp loadings are of the order of 100 w/in. of lit lamp length with a life of 5,000 hours. These loadings might be increased two or three times under certain circumstances with considerably reduced life.[3]

Advantages

Due to their low thermal inertia the lamps achieve full operating temperature almost immediately on switching on and when switched off lose 80 per cent of their maximum temperature within two seconds. Such rapid cooling enables i.r. lamps to be used in installations where other forms of heater such as gas-fired ceramic or metal sheathed electric emitters might cause scorching or overheating of the product under similar conditions.

The low coefficient of expansion of quartz enables the lamps to be used in situations where others made in soft glass would crack or break due to thermal shock. Though the wall temperature of a lit quartz lamp may reach 600°F, the lamp will not fracture when ice cold water is splashed on to it.

The comparatively high temperature of the quartz tube also has the advantage of incinerating most dust which falls on it. It is, however, important where lamps have been handled or otherwise covered with grease to remove this by wiping them with a rag soaked in a grease solvent such as methylated spirits to avoid later devitrification of the hot quartz.

Besides radiating invisible i.r. energy, the lamps also give out visible light. Though in heating installations much of this light may be absorbed by the objects being irradiated and will thus be employed in raising their temperature, the direct or reflected light may be glaring or distracting to people in the vicinity if the lamps are not suitably screened.

Apart from its normal use for heating

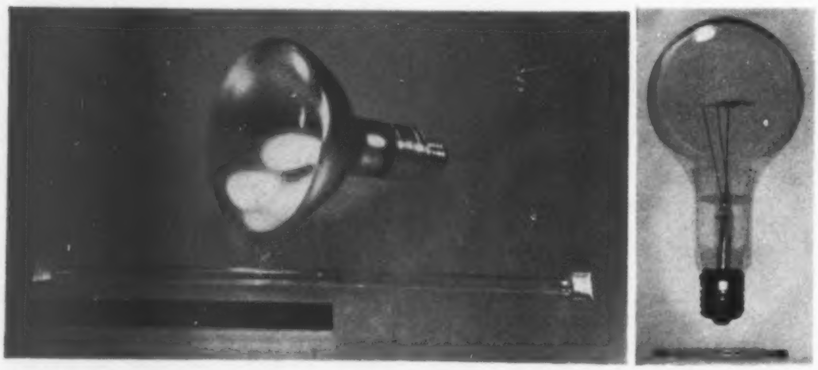


Fig. 3. Size comparisons of left (a) 250 w glass-bulb, internal-reflector i.r. lamp with experimental 1,000 w quartz-tube i.r. lamp and right (b) a 500 w g.l.s. glass-bulb lamp with an iodine-filled quartz-tube lamp of the same power rating.

the quartz tube i.r. lamp, having a luminous efficiency of about 10 lm/w and a life of over 5,000 hours, may also be used as a light source, the radiant heating in this case being of secondary importance. An example of the latter type of application is given in a later section. In certain circumstances, such as windowless buildings, or for occasional use in domestic rooms, the lamp might also be used as a combined source of light and heat.

Typical heating applications

Due to their relatively large power-output/volume ratio and elongated shape, these lamps, usually fitted with aluminium reflectors, are particularly suitable for individual use or for grouping together in flat banks or in irradiation tunnels. Ways of using quartz tube and other types of i.r. lamps mentioned above in more orthodox heating installations, together with detailed methods of calculating the intensity and number of lamps required for various general applications of water and solvent evaporation, mass heating and paint baking are given elsewhere[4] but the following paragraphs indicate some of the more interesting heating applications of quartz tube lamps.

Their comparatively low thermal inertia, and the facility they offer of achieving high thermal intensities make quartz tube lamps particularly suitable for drying heat-set inks used in high-speed colour printing for the packaging industry. The requirements are severe: the path over which the paper web travels between adjacent presses must be kept as short as possible to ensure correct colour register, which severely restricts the equipment space available and therefore requires a high heating intensity, with minimum delay in reaching the required temperature on starting and rapid thermal decay on stopping to avoid scorching the paper. Such conditions, which usually preclude dull red emitters, have been satisfied by using quartz tube lamps in specular trough reflectors, in combination with a knife-edge blast of cold air to remove evaporated ink solvent and some of the residual heat in the paper. Drying by this method has been achieved at speeds exceeding 1,600 ft/min. Inks printed on certain cellulose or polythene films may be dried very rapidly at temperatures exceeding the melting point of the film as infra-red passes through these materials with little absorption.

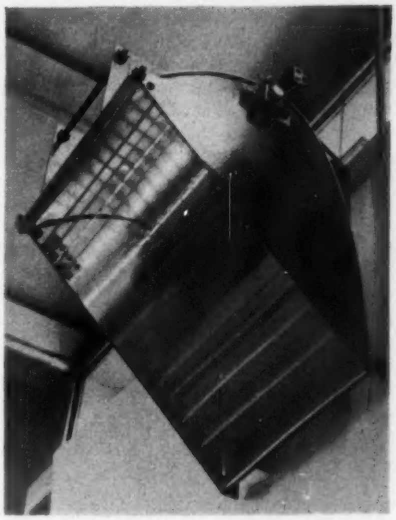


Fig. 5. Prototype louvered trough reflector for quartz-tube lamps used in an experimental lighting installation.

Office copying machines use heat sensitive paper placed on top of the original which is then passed under a quartz tube i.r. lamp with a close tolerance filament. The latter is arranged in a suitable reflector so as to produce an intense line of infra-red radiation across the paper which transmits it, the radiation being absorbed in the material to be copied which heats up and forms an image in the sensitized surface. A printing speed of four seconds per copy is claimed by the manufacturers for one type of machine.

By using automatic meal vending machines, particularly in factories having night shift workers, meals may be prepared in advance and then chilled in the machine at a temperature of 45°F until an hour before they are required. Thermostatically controlled 1,000 w vertically burning quartz tube lamps, of the type illustrated in Fig. 1, mounted in the food compartment of the machine are then switched on to heat the food to the required serving temperature.

In one form of proprietary chicken roasting machine quartz lamps provide both high-intensity illumination of the cooked birds and maintain the interior of the oven at an even temperature when the main cooking elements are switched off.

Table 1

Characteristic data of normal quartz tube i.r. lamps

Rating		Physical dimensions			Colour-temp	Declared life*
Voltage	Watts	Length mm	Diameter mm	Lit length mm	°K	hours (Min)
100, 115 120, 125	500	205±4	8·5–10·5	145±4	2,400	5,000
220,225 230, 240 250	1,000	350±4†	8·5–10·5	290±4	2,400	5,000

† Varies with type of cap.

Table 2

Characteristic data of quartz tube lamps with close-tolerance filaments

Rating		Physical dimensions			Colour-temp	Declared life*
Voltage	Watts	Length mm	Diameter mm	Lit length mm	°K (min)	Hours (min)
240, 260	1,350	302±3	8·5–10·5	258±4	2,700	5,000
336	1,620	353±3	8·5–10·5	309±4	2,700	5,000
490	2,360	493±3	8·5–10·5	448±4	2,700	5,000

Table 3

Characteristic data of quartz tube lamps for vertical burning

Rating		Physical dimensions			Declared life*
Voltage	Watts	Length mm	Diameter mm	Lit length mm	hours (min)
240/250	1,050	856±4	8·5–10·5	755±4	5,000

* Under specified conditions.

Quartz lamps as light sources

If a quartz tube i.r. lamp of the type described above has its applied voltage in-

creased so that the colour temperature is changed from about 2,500°K to 3,000°K there will be a proportionately greater amount of visible light emitted from the lamp for a short time. Due to the lamp's higher temperature the outer layers of the filament will evaporate more quickly, the tungsten being deposited on the inner surface of the comparatively cooler wall of the quartz envelope as a black powder, with the result that the light output will gradually fall after a short time. The blackened wall will absorb much of the radiation from the filament and re-radiate long-wave energy back to the hot wire which will thus increase in temperature so that the evaporation from the filament is accelerated. Finally, little or no light will come from the lamp and eventually the filament will fail due to increased localized heating.

Various attempts have been made in the past to prevent the deposition of evaporated filament material on the inside of the lamp envelope, in particular by adding small quantities of a halogen (iodine, bromine or chlorine) to the gas filling of various types of lamps. Under the conditions obtaining in a quartz tube lamp containing iodine, the iodine molecules dissociate into atoms and combine with evaporated tungsten at the bulb wall to form tungsten iodide. This compound migrates to the vicinity of the filament where it is dissociated, the tungsten being returned to the filament and the iodine being made available to repeat the cycle. Under ideal conditions the process should continue *ad infinitum*, as long as the filament remains alight and the conditions given below are maintained, with the luminous efficiency of the lamp remaining practically constant. In practice, however, due to the uneven coating of tungsten deposited on the filament, 'hot-spots' are formed and the filament eventually burns out. Iodine-filled lamps which have been run with artificially cooled walls, quickly blacken but become clear within a few minutes as soon as they are run normally.[2]

Iodine cycle requirements

The above explanation of the iodine cycle may be considered rather naïve but is sufficient for a general understanding of the phenomenon as applied to this form of lamp. For the cycle to function satisfactorily it is necessary to fulfil the following conditions:

1. The temperature of the lamp envelope must be between 250 and 1,200°C. In general this makes iodine filling unsuitable for glass-bulb lamps, as convection currents of the gas filling and the comparative remoteness of the wall and hot filament reduce the envelope temperature below threshold. If the upper temperature limit is exceeded the iodine cycle does not function and blackening of the lamp wall takes place.

2. The relative dimensions of the shorter quartz tubes seem to limit the flow of hot gases due to the Langmuir effect, thus reducing heat losses, but for longer lamps it is essential that they are operated within about 4° of horizontal to avoid separation of the iodine from the gas filling, leading to failure of the iodine cycle.

3. The tungsten filament for loadings greater than about 150 w usually need supporting by tungsten supports and for all lamp wattages the lead-in wires projecting into the tube must also be tungsten.

4. As for the i.r. lamp, seal temperature is a limitation.

5. An external fuse should be used to limit the lamp current and prevent an arc being drawn on failure of a filament which might otherwise rupture a short envelope lamp, particularly when the lamp is being switched on towards the end of its life.

Advantages of iodine filling

It must be emphasized that the iodine filled lamp is as yet only in an experimental design stage in this country and it may be some time before it is reliably available. Pending its appearance on the commercial market and its use in field trials it is suggested the lamp would have the following advantages:

1. A comparatively high and consistent luminous efficiency (21 lm/w over a life of 2,000 hours has been claimed in America for a 500 w lamp).

2. A volume approximately 1 per cent of a g.l.s. lamp of the same wattage (Fig. 3b).

3. It permits the size of associated optical components to be reduced, by virtue of accurate filament location and small envelope cross section, giving more accurate optical control than is possible with similar wattage tungsten lamps of conventional construction.

4. As a line filament light source, it enables a rectangular distribution with sharp cut-off to be achieved, with consequently greater precision and economy in lighting design under certain circumstances.

5. Its construction offers the facility of high-voltage operation where required.

As running the lamp in conditions which would lower the wall temperature below 250°C would make the iodine cycle non-operative, it is not usually feasible to employ the lamp in very draughty situations or below water without a suitable protective covering.

Lighting applications

Examination of the above factors suggests that this experimental light source could be used for most purposes using g.l.s. lamps as long as the limiting conditions given above are fulfilled. The longer type of quartz lighting lamps may be mounted in suitably designed near parabolic trough reflectors as shown in Fig. 4 to give a cosine distribution of light in the plane of the major axis of the lamp and a very narrow distribution in the plane of the minor axis. Some control of the shape of the lengthwise distribution may be obtained by using curved end-reflectors and this also has the desirable effect of deflecting radiation away from the end seals of the lamp.

Fig. 5 is a photograph of a prototype louvered specular aluminium reflector fitting used in an experimental lighting installation in a church in which the height of the nave was nearly twice its width. As artificial light of a similar colour-appearance to that of candle-light had been specifically requested and the difficulty of lamp replacement made a long life lamp desirable, 1,000 w quartz i.r. lamps were used.

The effectiveness of the control of light from quartz linear filament lamps by comparatively small fittings suggests that they could be attractively used for such purposes as the floodlighting of buildings, display lighting of posters and pictures, and for sports stadia, swimming pools, high factory bays, shop-windows and theatrical, TV and cinema studios among many others. Its size and shape make it particularly suitable for use in parabolic trough-shaped specular reflectors to produce a divergent beam of light in the plane of the major axis of the lamp with a narrow distribution in the plane of the minor axis.

Acknowledgments

The authors thank Mr G. S. Turner of Strachan & Henshaw Ltd for supplying helpful information on the use of i.r. lamps in printing machines. They also acknowledge the assistance given by their colleagues and permission given by the Directors of the A.E.I. Lamp and Lighting Co Ltd, to publish this article.

References

1. Maxted, R.: 'Infra-red radiation and equipment: Their application to industrial heat processes', *Trans. I.E.S.* (London), 7 (January 1942).

2. Davies, L. J.: 'The generation of light', *Trans. I.E.S.* (London), 25 (No. 1, 1960).

3. Hodge, W. F.: 'Developments in quartz infra-red lamps', *Illum. Eng.*, 55 (September 1960).

4. 'Mazda' lamp data sheet, No. 16-1-A (March 1959), A.E.I. Lamp and Lighting Co Ltd, Melton Road, Leicester.

5. Zubler, E. G.; Mosby, F. A.: 'An iodine incandescent lamp with virtually 100 per cent lumen maintenance', *Illum. Eng.*, 54, 734 (December 1959).

Making Research pay its way

Reorganization at GEC to give closer links with Commercial Groups

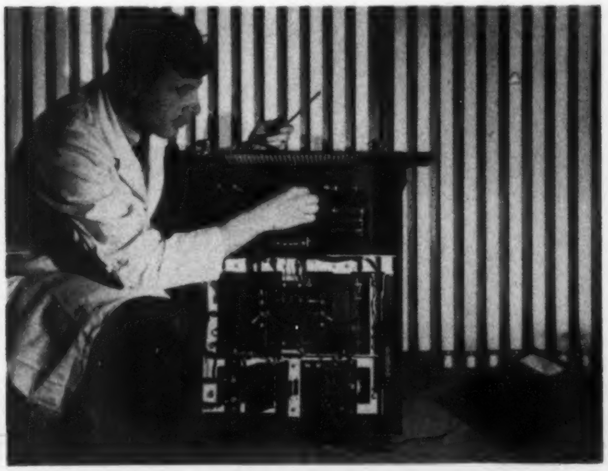
SUCCESSFUL ADMINISTRATION OF RESEARCH in large industrial organizations is a problem of growing complexity, particularly in view of the apparently conflicting trends towards amalgamation and the consequent increase in size of individual units on the one hand and towards decentralization within those units on the other. The General Electric Co Ltd, which has been carrying out a decentralizing reorganization within the last year or so, has decided to extend the process to its research laboratories, with the aim of relating applied research more closely to commercial development and therefore making it more remunerative.

As announced by Mr O. W. Humphries, the Company's Director for Research and Technical Development, at a visit we were recently privileged to make to the laboratories, GEC are to set up autonomous research units, operating side by side, to enable those of the commercial groups and subsidiary companies of the GEC that wish to do so to have research units under their own control. To mark this fundamental change in policy, the laboratories are to be renamed 'The Hirst Research Centre', as a tribute to the company's founder, the late Lord Hirst.

The function of the units will be to co-operate with their associated group to ensure that developments shown to be economically viable can be commercially exploited in the shortest time, thus bringing returns on the research expenditure involved reasonably quickly. To ensure that long-term research continues to be undertaken, GEC are also establishing two main research units. One is the Central Research Laboratories which will be responsible for most of the more fundamental research programmes, whether on behalf of the company as a whole, or the groups or subsidiaries. They will also provide specialized scientific and technical services and advice to the Centre and will ensure effective scientific liaison between all units. The other unit is the Telecommunications and Engineering Research Laboratories which will carry out work for the Telecommunications and Engineering Groups and also undertake long-term research in related fields.

The outward effect of the change will not be felt for some time so that lighting and lamp research, of which we were able to to see some aspects, will retain for the present its familiar character. Of lamp developments, interest centred in the iodine-filled quartz-tube filament lamp. Perhaps the nearest thing to commerical development in Britain for this light source is as an integral ballast in an MBF fluorescent bulb mercury vapour lamp, enabling the combined light source to be operated direct from the supply without ancillary gear. Another development, directed at still further improving the efficiency of sodium lamps, takes the form of a thin gold film deposited on the inner surface of the vacuum jacket to act as a heat mirror to reduce thermal losses, thus achieving up to 130 lm/w. It was also interesting to note that this was being used in conjunction with a discharge tube both dimpled and grooved.

Vertical-plane circular track erected for lumen-output measurements on lanterns too large for the mirror photometer. The measuring element is moved along the track by a rotating helical cable.



Right experimental 240v, 450w mercury-tungsten discharge lamp, containing 250w MBF lamp and 200w iodine-quartz filament lamp to eliminate control gear; overall efficiency is 27 lm/w.

Left, experimental inverter set using two gate-controlled silicon rectifiers, giving an a.c. output from 110v, d.c., seen here to supply a bank of sixty 40w fluorescent tubes.

LIGHTING ABSTRACTS

OPTICS AND PHOTOMETRY

930. Heterochromatic Photometry. 535.241

J. Terrien, *Bull Soc. Franc. Elect.*, 8th series, **10**, 655–662 (*October* 1960). *In French.*

A short review and longer discussion on methods of precise photometry of heterochromatic sources, with their advantages and limitations. J. M. W.

931. The performance of the eye and visual tasks. 612.843.36

A. Arnulf, *Bull Soc. Franc. Elect.*, 8th series, **10**, 663–671 (*October* 1960). *In French.*

An outline and discussion of investigations on visual performance by Weston, Blackwell, de Boer and in the USSR. J. M. W.

628.931

932. Calculation of illumination from circular strip sources.

J. Roch, *Lichttechnik*, **12**, 616–617 (*November* 1960). *In German.*

Derives an expression for the illumination at any point on a horizontal plane at a given distance below a circular strip source, such as a ring of fluorescent lamps in an enamelled trough reflector, assuming the light distribution to be similar to that from a uniform diffuser. Graphs may be used to assist in the calculation. Two worked examples are given. J. W. T. W.

535.853.4

933. Filter monochromator with variable interference filter.

J. Krochmann and F. Schwarzkopf, *Lichttechnik*, **12**, 613–616 (*November* 1960). *In German.*

The author describes the characteristics of the interference filters now available, in which the wave-length of maximum transmission changes from 400 to 700 or from 700 to 1,000 nm from one end of the filter to the other. The band-width to one-tenth intensity is about 25 nm for a maximum transmission of about 40 per cent. Two filters may be used in series to improve the purity, but at the cost of lower transmission. The optical system of a monochromator including such a filter, and its use for the determination of a spectral reflection curve, the spectral sensitivity curve of a photocell, etc., are described. J. W. T. W.

LAMPS AND FITTINGS

628.97

934. Road traffic signals: 1, Some aspects of traffic signalling; 2, Reflex reflectors for automobiles; 3, Recent data on the threshold of visual perception of signals.

1, H. Boissin; 2, M. Debure; 3, R. Pages; *Bull Soc. Franc. Elect.*, 8th series, **10**, 638, 643, 648 (*October* 1960). *In French.*

Three papers, of which the first is a general discussion, with some information on French traffic signalling practice, including sizes and colour limits. The second records tests made on reflex reflectors at various ranges, illuminated by driving and passing beams and with and without the presence of glare from opposing headlights. It was concluded that reflectors giving 20 mcd/lux were insufficient; reflectors giving 50 mcd/lux illuminated by two headlights using passing beams were visible at 100 m without glare, and at 50 m in the presence of glare from passing beams of headlights at the same distance. The third paper is a study, largely theoretical, of the vision of signals. Some data are given of tests on vision of signals in the presence of distracting information; the tests are criticized in some points, as are also those based upon the method of multiple describable criteria. J. M. W.

935. Development trends in filament lamps. 621.326.7

W. Schilling, *Lichttechnik*, **12**, 610–612 (*November* 1960). *In German.*

The author describes in turn the five principal fields in which developments are taking place in the design of tungsten lamps. These are (i) improvement in efficiency by the use of krypton for gas filling, (ii) reduction in the luminance of the lamp as a whole by the use of diffusing bulbs, (iii) increase in the luminance of the source, for projection purposes, (iv) concentration of the emitted flux by the use of specular bulbs of ellipsoidal form, and (v) reduction in bulb sizes. Detailed information is given to show the present state of development, while prospects for future progress are indicated. J. W. T. W.

621.327.43

936. Improvement of colour rendering of fluorescent lamps.

P. Lemaigre-Voreaux, *Lux*, 22–27 (*January* 1960). *In French.*

The spectra and the relative energy in the eight standard spectral bands are given for a number of lamps, giving some information on combined mercury vapour/tungsten (MBT) and fluorescent-bulb mercury vapour (MBF and MBF/U) lamps, xenon discharge lamps and a tellurium vapour discharge lamp not in commercial production. J. M. W.

LIGHTING

937. Lighting in a new tennis hall in Stockholm. 628.977

R. Nylander, *Ljuskultur*, **32**, 119–120 (No. 3, 1960). *In Swedish.*

A tennis hall, 56 m by 35 m has been lit by sixteen special fittings each incorporating seven 80w 'white' fluorescent tubes, and giving a 45° cut-off. The illumination is of the order of 30 lm/ft². R. G. H.

628.973

938. Congress Hall in the new Socialist Party headquarters in Stockholm.

L. Carlsson, *Ljuskultur*, **32**, 135 (No. 3, 1960). *In Swedish.*

A new auditorium in Stockholm seating 1,500 has been illuminated by in-built ceiling ornamental filament lighting, giving approximately 17 lm/ft². Supplementary directional lighting from anodized aluminium reflector units, also ceiling mounted, gives a further 16 lm/ft². Over the podium, additional lamps in coloured parabolic reflectors give approximately 35 lm/ft². R. G. H.

939. Problems of lighting in picture galleries. 628.977

A. Salomon, *Lux*, 16–21 (*January* 1960). *In French.*

An exposition of the problems of lighting in picture galleries with special reference to avoiding reflections in the varnish or glazing, with several modern examples. J. M. W.

940. The lighting of the Olympic Games at Rome. 628.971

Renzo Grandi, *Lux*, 206–210 (*November* 1960). *In French.*

Details are given of the lighting systems for the Olympic Stadium, swimming and diving pools and cycle track. The stadium, with overall dimensions of 315 m by 180 m and spectator capacity of 100,000, incorporates a football pitch surrounded by a 400 m six-lane running track. The pitch is lighted from 240 deep paraboloidal reflectors with 1,500w lamps distrubted equally among four 60 m high towers set at the back of the stands on the goal lines. Each tower also carries 40 narrow-beam projectors with 500w lamps for the running track, whilst the two towers behind the main stand also carry an additional ten 500w projectors for lighting the entry, high jump and long jump areas. The swimming pool is lighted by four towers each carrying fifteen 1,500w projectors at a hight of 33 m above water level; the two towers adjacent to the diving pool each carry eight further projectors for that pool and four narrow-angle projectors for the diving boards. Both pools are also lighted by 1,000w projectors working through side portholes 50 cm below water level and spaced at 4 m intervals, whilst the diving pool has a further eight submerged reflectors at a depth of 3·5 m. The cycle track is lighted similarly to the stadium, with eight towers each carrying 16 narrow-angle 1,500w projectors giving an illumination of more than 400 lux. J. M. W.

628.98

941. The replacement of fluorescent lamps in a large installation.

J. Parent, *Lux*, 198–205 (*November* 1960). *In French.*

The economics of individual and group replacement are studied, and it is concluded that group replacement is almost always more economical than individual replacement, the most advantageous replacement period being, for the data assumed, of the order of 4,000 hr. The calculation includes allowances for the cost of unproductive energy expended and capital engaged in a lighting installation which is giving less light than it was designed to give; these two factors together are far larger than the costs of energy, lamp replacement and labour. The amortization period is taken as five years. J. M. W.

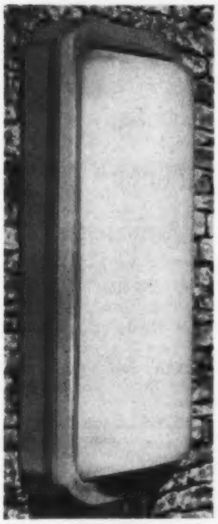

SKYLINE
by BENJAMIN REGD.
Flowing lines of light . . .
'Sky-Line'...in single, elegant fittings or coupled in flowing lines for hotels, stores, supermarkets, offices and all commercial areas.
Please write for illustrated brochure.
better lighting by BENJAMIN REGD.
THE BENJAMIN ELECTRIC LTD TOTTENHAM · LONDON · N.17
Telephone: Tottenham 5252
Grams: Benjalect · Southtot · London
BIRMINGHAM
5 Corporation Street · Tel: Midland 5197
LEEDS
49 Basinghall Street · Tel: Leeds 25579
BRISTOL
Royal London Building · Baldwin Street
Telephone: Bristol 28406

Smee's 162

NEW PRODUCTS

Fluorescent bulkhead units

MINIATURE FLUORESCENT LAMPS have given a new look to the bulkhead lighting fitting, for which use they are ideally suited. Two new fittings of this kind were announced recently, from AEI-Siemens and from Heyes. The Siemens-Ediswan unit is a compact, weatherproof design, housing up to three 12 in. 8w tubes. The diffuser is of 030 stippled 'Perspex' contained in ring of cast aluminium alloy which is so hinged that it can be lifted up at right angles to the body and lifted clear away to facilitate access for maintenance. Within the body (also of cast aluminium alloy) the reflector, which is of bonderized sheet metal finished in white stoned epoxy-resin enamel, is also fastened to permit it to be swung to one side for access to the control gear behind. The Heyes bulkhead fitting is designed for two 21 in. 13w tubes. Known as the type 1316 'Fluolacent', it has an opal 'Perspex' bowl, hinged at one end and secured by a single fixing screw at the other. The base plate is of aluminium accommodating a rubber seal with the cover; the lamps are mounted on a steel plate which may be readily detached for access to the control gear.



Left, the AEI-Siemsn fluorescent bulkhead fitting for three 12 in. miniature tubes.

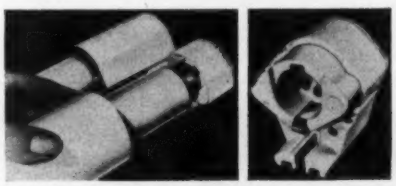
AEI Lamps and Lighting Department, 38-39 Upper Thames Street, London, EC4.
Heyes and Co. Ltd, Water-Heyes Electrical Works, P.O. Box 60, Wigan, Lancs.

Lighting for propagation

ARTIFICIAL LIGHTING APPLIED to replace or supplement daylight for plant growth is as yet primarily the subject of research rather than commercial exploitation but an indication of its increasing use is provided by the availability announced recently of 'standard' fittings for this purpose. The fittings, made by the Simplex Dairy Equipment Co (a subsidiary of GEC), take the form of an angle-iron frame carrying five fluorescent tubes and suspended on wires at heights of between 18 in. and 36 in. above the plants. Frames are made in two sizes, for 5 ft and 8 ft lamps respectively.
Simplex Dairy Equipment Co Ltd, Sawston, Cambridgeshire.

Bayonet-cap/bi-pin interchangeability

USERS OF FLUORESCENT FITTINGS designed for lamps with bayonet caps are faced with the problem of having to carry parallel stocks of lamps with bi-pin caps if they extend or amend an installation by adding more modern fittings, for which bi-pin lamps are now standard. For users of Benjamin fittings, however, the problem was solved by the introduction recently of a new bayonet-cap lampholder interchangeable with the bi-pin holders on their 'Taskmaster' reflector and 'Litemaster' diffuser fittings. The b.c. holder is of the pedestal type in which the plunger contacts are carried on a piston which is depressed into the pedestal body when the lamp is inserted and which thus cater for small variations in lamp length. Each piston is retained by a pair of coil springs by which end thrust is exerted on the lamp to hold it in position.
Benjamin Electric Ltd, Brantwood Road, London, N17.



Right, Benjamin's new d.c. lamp-holder which is interchangeable with bi-pin holder on their 'Task-master' fittings; the flicker shield is separate.

Sealed-beam lamps for aircraft

FOLLOWING ALMOST ON THE HEELS of the announcement of sealed-beam headlamps for cars, AEI Mazda now indicate that a similar lamp has been developed as a landing lamp for aircraft. The new lamp has all the advantages of this form of construction—more accurate filament location and therefore improved beam pattern and lumen output maintenance approaching 100 per cent—whilst permitting lighter and more compact fittings. The lamps have ratings of 400w and 1,000w at 28v and are interchangeable with American counterparts. Another AEI aircraft lighting development is a capless panel lamp for general lighting, rated at 10w, 28v, scheduled for installation in the VC 10 and Super V 10. It has been subjected to a vibration analysis over a frequency range of 10 to 2,500 c/s at an acceleration of 10 g.
AEI Lamp and Lighting Co Ltd, Melton Road, Leicester.

Cap up—cap down

WITH THE AIM OF securing uniform lamp performance irrespective of mounting position, Crompton have introduced a zig-zag filament form for their 100w g.l.s. lamps. This arrangement, coupled with fully-closed filament supports, is claimed to give a useful lamp life irrespective of burning position, more even heat distribution within the bulb and, in a pearl bulb, better diffusion.
Crompton Parkinson Ltd, Crompton House, Aldwych, London, WC2.

'Stick-Lights' for forecourts

A RANGE OF VERTICAL fluorescent tube fittings has recently been introduced by Extol Engineering for the lighting of forecourts and streets. There are three main lanterns, all mounted on 8 ft poles, which gives them the trade name 'Stick-Lights'. The type I lantern is for two 2 ft, 20w tubes, type II for four 2 ft, 40w tubes and type III for four 5 ft, 80w tubes. The smallest lantern is also available mounted on a 1 ft pole for use as a bollard. Also available is a lantern using two 9 in. 6w tubes for use as a marker. In all cases, warm-white lamps are used as standard. The lanterns consist of a cylinder of opal 'Perspex', with caps and bases of zinc-treated steel, heavy-duty stove-enamelled; the poles are similarly finished, the standard colour being white.
Extol Engineering Ltd, Park Road, High Barnet, Herts.

An installation of Extol 'Stick-Lights in the forecourt of a petrol station in Harlow.

IES Activities

TO MARK THE OCCASION of the Golden Jubilee of The Illuminating Engineering Society the award of the IES Gold Medal was instituted. The medal may be awarded at intervals of not less than two years. The first medal was awarded in 1959 and nominations for the next award are now invited. Details of the award and the procedure for making nominations are given in the current issue (Vol 26, No. 1) of the *Transactions*.

London Meeting

WITH THE TREMENDOUS NUMBER of calculations which are usually entailed in developing or using improved lighting techniques, it is hardly surprising that lighting engineers should turn to electronic computers to eliminate this tedious part of their work. To what extent computers may be used was discussed at January's London Sessional meeting in a paper by H. E. Bellchambers, G. K. Lambert and H. R. Ruff.

The authors started with an explanation of the way analogue and digital computers operate, their task made much easier by the use of ingenious working demonstrations. They then went on to show that computers may be used both as research tools and aids to routine design, the former category being exemplified by employing a resistance network analogue for determining surface luminances due to inter-reflections in lighted interiors.

With digital computers, the problem must initially be broken down into a form which may be readily handled, and a programme formulated, this being the instructions given to the computer for the calculations it has to perform and in what order. Examples of its use are the evaluation of discomfort glare in a lighted interior and the study of street lighting. An example of a computer applied as an aid to routine problems, was given in a film showing its use in the design of an area floodlighting scheme.

Discussion was lengthy, and at times involved, but most speakers were agreed that, when using computers, the problem became that of correctly analysing the voluminous data it made available. It was also indicated that, to get the best out of a computer, it was essential to keep it fully employed; there was no point in using it for only part of a calculation, with the engineer concerned completing the calculation himself.

In the Centres

AT ITS DECEMBER MEETING, the Sheffield Centre enjoyed an absorbing paper, 'Chance and Vision', presented by Dr D. L. Smare, who described experiments which had been undertaken to find out the minimum amount of light incident upon the eye which produces a response. The lecturer explained that the conditions under which the experiments were undertaken were that a small area of dark-adapted retina, displaced by some 20° from the fovea, was exposed to minute quanta of light while fixating a red lamp. The wavelength of light used lay in the greenish band of the spectrum (at which eye sensitivity is greatest) and for physical reasons this was flashed by a shutter into the observer's eye. The smallest perceptible amount of light turned out to be so limited that no complete observation success or failure for any given amount of light was achieved, this being due to the very limited number of basic quanta present during the experiment. Dr Smare explained that when in dealing with such amounts of quanta the results of the experiment can only be satisfactorily interpreted by applying the same sort of mathematical treatment which governs chance phenomena such as the toss of a coin.

FOR THE BENEFIT OF those members who live some way away from its normal meeting place, Birmingham Centre have arranged three Sessional Meetings in other localities during the current season, the second being held at Coventry in December when the city's Lord Mayor kindly placed the Council Chamber at the Centre's disposal. Mr F. P. Bentham gave a talk on 'Stage Lighting', a most informative illustrated discourse on some of the latest methods and equipment employed in the theatre today, showing the accurate control obtained with modern flood and spotlighting projectors. In particular, his examples of scene projection were most fascinating and his address a most excellent introduction to the tour of the new Belgrade Theatre, which followed. The theatre authorities gave the Centre free access to the stage, set for the evening performance, and here Mr Bentham detailed the items and uses of the lighting equipment whilst the theatre electricians explained the operation of the control panel. Following the visit, the party was entertained to tea by the Lord Mayor and Lady Mayoress, in the Armoury of St Mary's Hall. Those who wished to do so returned to the Belgrade Theatre for the evening performance of the play 'Oliver Twist'. This combined Sessional Meeting and social event received the excellent attendance it merited, and members and their guests experienced a unique presentation of one branch of lighting techniques, from instruction in theory by Mr Bentham, to the practical application of stage lighting for play presentation.

Forthcoming Events

LONDON

February 28
Sixth Trotter-Paterson Memorial Lecture: Long-range weather forecasting, by Sir Graham Sutton. Royal Institution, Albemarle Street, W1, 6 p.m.

CENTRES

February 1
EDINBURGH. Lighting in industry in the Soviet Union, by E. H. Norgrove. YMCA Social Room, 14 South St Andrew Street, 6.15 p.m.
NEWCASTLE-UPON-TYNE. Hospital lighting, by G. R. N. Chalmers. Room B7, Percy Building, King's College, Queen Victoria Road, 6.15 p.m.

February 2
CARDIFF. Lighting techniques.
GLASGOW. Office lighting, by L. H. Hubble. British Lighting Council, 29 St Vincent Place, C1, 6.30 p.m.
NOTTINGHAM. Display lighting for shop windows, by H. H. Ballin.

February 3
SWANSEA. Annual dinner and dance.

February 9
MANCHESTER. Floodlighting of Liverpool Cathedral, by C. C. Smith. Demonstration Theatre, NW Electricity Board, Town Hall Extension, 6 p.m.

February 13
SHEFFIELD. Presidential Address, by W. S. Stiles. Grand Hotel, 6.30 p.m.

February 20
LEEDS. Presidential Address, by W. S. Stiles. British Lighting Council, 24 Aire Street, 6.15 p.m.

February 21
LIVERPOOL. Lighting of Niagara Falls, by D. J. Reed and T. D. Proctor. Electrical Industrial Development Centre, Merseyside and N. Wales Electricity Board, Paradise Street, 6 p.m.
NORTH LANCS. Hospital lighting, by D. C. Pritchard.

February 22
BATH AND BRISTOL. Home lighting, by D. W. Durrant. Luncheon meeting at Bath.

February 23
LEICESTER. Basis of recommended illumination levels in Britain and the USA, by A. W. Marsden. Demonstration Theatre, E. Midlands Electricity Board, Charles Street, 6.15 p.m.

February 27
BIRMINGHAM. Annual General Meeting; Plastics for lighting, by W. E. Harper; Glass for lighting, by J. G. Holmes. Regent House, St Phillip's Place, Colmore Row, 6 p.m.

MISCELLANY

Book Review

'Practical Electrician's Pocket Book 1961', edited by R. Norris. Published for 'Electrical and Radio Trading' by Odhams Press, London, 1960. Pp. 530. Price 7s. 6d.

The latest edition of this popular annual contains, among a number of new and revised features on aspects of electrical engineering, a re-schemed section on lighting to provide greater practical guidance. The lighting section has been divided into four sub-sections, dealing with application, lamps, fittings, and planning for general lighting schemes; the first has in turn been sub-divided into domestic, commercial (specifically offices, shops, restaurants, schools, hospitals, churches, pictures), industrial and floodlighting, whilst the second has been sub-divided into three, giving a concise review of the whole subject, detailed accounts of discharge lamp circuits and tabular data. The sub-section on fittings not only reviews the main types of fitting and their classification but also discusses architectural lighting and luminous ceilings. The section concludes with extracts from the list of illumination values recommended in the IES 1955 Code.

L.L.

Personal

Mr E. R. ACRAMAN has been appointed a director of Pope's Electric Lamp Co Ltd. He has been sales manager of the company for the last four years and will continue to be primarily concerned with sales promotion activities.

New representative for Philips' Lamp and Lighting Group in their south east region is Mr D. H. GODDARD. He replaces Mr N. A. RICHARDSON who has been appointed manager of the domestic lighting fittings department at the Brixton works.

Rotaflex (Great Britain) Ltd announce the appointment of Mr K. C. WHITE as executive sales director to head the company's new Architectural and Display Division, which section of their business is now to be known as 'Lightplan'. Mr White, who comes to Rotaflex from the Courtney, Pope Group, is a member of the IES and has worked in the past 14 years as a lighting engineer specializing in the lighting of shops, stores, displays and exhibitions. He is to lead a team of engineers offering a 'Lightplan Design Service' and will also be responsible for the formal introduction of new fittings.

Three appointments were recently announced by Cryselco Ltd. Following the retirement of Mr S. G. ELLIOTT-SMITH after 40 years service with them, Mr H. ELLIOTT has been elected to the board and appointed general manager. Mr Elliott joined Cryselco in 1936 and has been Sales manager since 1956. Another new member of the board is Mr V. F. PERRY, who was elected to fill the vacancy caused by the retirement of Mr J. H. REISEGER. Mr Perry has been secretary of the company since 1950 and continues in that position. To replace Mr Elliott as sales manager is Mr F. J. BURNS, a well-known member of the IES and Chairman of Liverpool Centre in 1956. He has been with Cryselco since 1941, having been Liverpool branch manager and assistant sales manager.

Mr A. S. BLACK, a director of the GEC and their area manager for Scotland, retired at the end of last year after 50 years' service with the company. He is succeeded as area manager by Mr J. S. LANGLANDS, previously assistant area manager since 1954 and before then vice-president and managing director of the Canadian branch of the firm, which he helped to establish.

Midlands area representative of Lumenated Ceilings Ltd is Mr R. H. HAZLEHURST. Until permanent office accommodation is available he will operate from the Birmingham Engineering and Exchange Centre.

British Standards

B.S.3275:1960, *Glass for signs and recommendations on glazing for signs;* 3s.

A new publication, this standard specifies requirements and makes reommendations for glass for use in signs, with emphasis on performance and on safety of the public. For this reason, toughened or laminated safety glass is recommended generally; if annealed glass is required on technical grounds, protection should be afforded by a panel of toughened or wired glass. The standard is in two sections, the first specifying quality and marking of glass for box signs and panel signs, the second making recommendations for the use of glass in this way, dealing with glazing, fixing, strength of supporting materials and ventilation.

B.S.1332:1960, *Guide to civil land aerodrome lighting;* 12*s.* 6*d.*

Revised to take account of international agreements and developments, this new edition is based on Annex 14 (3rd edition, 1948) of the International Civil Aviation Organization, and describes the types of aircraft lights and their use at aerodromes which, as far as can be seen for the immediate future, should give within practicable limits the visual assistance pilots require under various conditions. Since no international standards as yet exist for helicopter stations, recommendations for this have not been included, although it is hoped to add them at a later date. The Guide is in twelve parts, covering definitions, general requirements, beacons, approach lighting, angle of approach indicator systems, runway lighting, circling guidance lighting, taxiway lighting, taxying guidance, obstruction lighting, luminous landing direction indicators and lighting at grass aerodromes.

B.S.1853:1960, *Tubular fluorescent lamps for general lighting service;* 7*s.* 6*d.*

Whereas the 1956 edition covered lamps used in switch-start circuits only, this new edition covers lamps for universal use and its scope has been widened to include 80w lamps with bi-pin caps and 125w lamps with both bayonet and bi-pin caps. As in the 1956 edition, the standard sets out its clauses in a manner similar to that adopted by the IEC for standards for electric lamps. Quality levels are controlled by means of the proportion of lamps in a given batch falling outside prescribed limits. The standard specifies technical requirements together with methods of test to be used for determining the quality and interchangeability of the lamps.

B.S.469:1960, *Electric lamps for railway signalling;* 7*s.* 6*d.*

In this revision of the 1952 edition, the text has been re-arranged to bring it into line as far as possible with current standards, both British and International, dealing with lamps. The list of lamps covered by the standard has been amended to meet present and future requirements, with indication of preferred types. Technical requirements and methods of test are laid down, specifying quantities and quality levels for batch testing.

British Standards noted above may be obtained from the British Standards Institution, 2 Park Street, London, W1 at the prices stated; postage is charged extra to non-subscribers.

Industrial Notes

LAMP MANUFACTURERS have announced a cut in the price of 250w, MBF/U, fluorescent bulb mercury lamps. The new list price is £4 4*s.*, a reduction of 15*s.*

THE THEME OF the thirteenth British Electrical Power Convention, to be held at Eastbourne June 12 to 15, is 'Electricity in the prosperity and welfare of the Nation'. Its President will be Sir John Pickles, Chairman of the South of Scotland Electricity Board. Subjects to be discussed at the BEPC are electricity transmission, efficiency and economy in distribution and electrical manufacture, the speakers being, respectively, Sir Christopher Hinton, Mr R. R. B. Brown and Mr S. F. Steward; there is also to be a popular lecture by Dr A. E. Grauer, Chairman of the British Columbia Electric Co, and the Convention will close with the usual Electrical Forum.

IN OUR RANDOM REVIEW of 1960 in last month's issue, we omitted to indicate that the lighting of the Carpenters' Hall (pages

13 and 14) also employs equipment supplied by Allom Heffer and Co Ltd for lighting the soffit of the ceiling and the walls and that the illustrations of the 'Oliver' stage settings (page 16) were supplied by the Strand Electric and Engineering Co Ltd, who, of course, supplied both lighting and control equipment.

WE HAVE BEEN ASKED to point out that the GEC do not operate a contracting department for wiring installation, as suggested in our report of their extended credit scheme given on page 29 of our January issue.

IN LINE WITH PAST POLICY, the A.E.I. Lamp and Lighting Co Ltd and the General Electric Co Ltd are to form a new company to take over their glass manufacture and glass sales. The company is to be formed early this year to take over all glass manufacture other than that covered by Glass Bulbs Ltd, another jointly owned company formed in 1946 to put the manufacture of the popular sizes of lamp bulbs on a more economical basis. The present plan is to increase the glass tubing facilities at AEI's Chesterfield factory, and a three-year development programme costing £1 m. has been announced, whilst the GEC's Lemington-on-Tyne works is to be developed for hand-fabricated and special glass.

THAT EXPANSION IS a continuing feature of the lighting industry has been shown by announcements of new premises from three firms recently. Merchant Adventurers Ltd have completed stage 1 of their new head office and factory on a three-acre site at Feltham; they continued to operate their old works at West Kensington to clear a back-log of orders but, now that stocks have been built up, that factory has been closed and they are now operating solely at Feltham. Richard Daleman Ltd have just purchased a three-acre site at Wolverton where a new factory is planned, dealing exclusively with extrusions; this is accompanied by extensive rebuilding at their existing Latimer Road premises in West London where an extra 5,000 ft^2 of space will soon be available. Finally, Philips Electrical Ltd moved, in two week-end operations in January, their Scottish organization into its new regional headquarters, Highland House, in the centre of Glasgow.

Trade Literature

VICTOR PRODUCTS (WALLSEND) LTD, GPO Box No. 10, Wallsend-on-Tyne. Technical bulletin no. 39, describing their miniature fluorescent bulkhead lighting fitting.

LANCASHIRE DYNAMO ELECTRONIC PRODUCTS LTD, Rugely, Staffordshire. Recent new publications include leaflet no. L12, describing their automatic lighting control unit in which a photoelectric cell actuates the switching of lighting circuits.

THE GENERAL ELECTRIC CO LTD, Magnet House, Kingsway, London, WC2. New GEC decorative lighting fittings are described in a recent folder, whilst other leaflets describe the 'Slendora' tungsten ballast fluorescent fitting and 'Gaylon' decorative tungsten fittings.

LINOLITE LTD, 118 Baker Street, London, W1. Catalogue no. 43, a new publication which describes existing and new fittings in the firm's range. It is accompanied by a new price list and by public appeal leaflets nos. 42 and 44, for point-of-sale use.

ROTAFLEX (GREAT BRITAIN) LTD, 4-10 Nile Street, London, N1. Rotaplan light diffusing screens for space division are described in a new brochure. Other publications deal with architectural and display lighting, school fittings and magnetic base table lamp.

CRYSLECO LTD, Kempston Works, Bedford. Lamps and fittings available for the current lighting season are described in a new catalogue.

EKCO-ENSIGN ELECTRIC LTD, Preston House, 45 Essex Street, London, WC2. New publications produced for the current lighting season include catalogue ERC/60 dealing with the Essex range, FB/60 describing other industrial and decorative fittings, TC/60 on lamps and tubes, ACG/60 on fluorescent lamp control gear and accessories, and associated price lists.

ROWLANDS ELECTRICAL ACCESSORIES LTD, REAL Works, Hockley Hill, Birmingham, 18. New abridged catalogue, reference no. P6004 giving general details of the firm's range of floodlighting lanterns and similar equipment.

STRAND ELECTRIC AND ENGINEERING CO LTD, 29 King Street, London, WC2. 'Lighting for Entertainment 1961' is the title of new catalogue describing lanterns and lighting control equipment for theatres, concert halls, television studios and amateurs.

J. A. CRABTREE AND CO LTD, Lincoln Works, Walsall, Staffordshire. Publication no. 1218 which combines three earlier publications issued as supplements to their main catalogue.

METALLISATION LTD, Barclays Bank Chambers, Dudley, Worcestershire. New leaflet describing the firm's metal spraying processes for depositing heat resistant coatings on steel, iron and copper.

CHLORIDE BATTERIES LTD, Exide Works, Clifton Junction, Swinton, Manchester. Publication 143 dealing with their self-contained junior 'Keepalite' emergency lighting equipment.

Situations

Vacant

Wanted

Postscript

THERE SEEMS TO BE a certain amount of activity in the general service filament lamp field. Advertisements have appeared from firms well known and not so well known, making interesting claims for longer life for their lamps. Most of us had come to believe that the ultimate had almost been reached in filament lamp design before the war, and that any further improvements would be marginal. Many of us also, in the days of voltage fluctuations and 'load shedding', had come to feel that as we got older, lamp lives got shorter just as policemen looked younger. There was, in fact, an article in the *Municipal Journal* some time ago by F. W. Black of the Building Research Station which gave some interesting facts and figures for the performance of lamps under actual operating conditions of unreliable supply voltages. Now we have these claims for longer life with little if any loss of useful light. I recall too that Mr J. G. Holmes put forward the suggestion at the APLE Conference at Folkestone that the careful choice of under-run lamps might well prove economical in these days of heavy labour costs for lamp replacement, the lower luminous efficiency being possibly offset by the less frequent need to change lamps. There seems much sense in this. For my part I have under-run my household lamps for years. My labour may be cheap and so I may not be saving money, but I never have a lamp failure in the middle of a party. I renew the lamps in the main rooms regularly and use the old lamps in other parts of the house. Someone may ask why I do not have several lamps in each room. I do, but the failure of even one lamp during a lighting engineer's party is enough to change the conversation to professional topics.

WHEN I BRING MY CAR TO TOWN, which is very rarely these days, my route takes me along the Old Kent Road in the south east of London. This has recently been re-lit with sodium discharge lamps. I do not know who designed the installation, but it is very good. One can drive the three miles or so from New Cross to the Elephant and Castle in a uniform standard of good lighting, remarkably free from glare, even though a cut-off system is not used. The road is very wide, so the engineers had no easy task to light it well. Shortly after leaving the Elephant for Waterloo Bridge, the lighting changes to mercury discharge. The visibility is still good, but the glare is worse, perhaps by as much as one step on Dr Hopkinson's scale. I do not know if this is just a matter of the difference between sodium and mercury, as demonstrated by Stevens and Ferguson's work, or whether the light distribution is different, throwing more light into the eyes from the mercury installation. I would not claim that the Old Kent Road lighting is perfect, but it seems to me to hit somewhere near the best compromise between visibility and glare for a non cut-off distribution. When I get time I must try to find out more about it. I have not made up my mind whether the frequent changes in the light source used in streets, as one journeys from one London borough to another, is a good or a bad thing. Provided the standard of lighting is good, the change makes for variety and helps one to identify a change of district. What must be avoided at all costs is a change from good street lighting to bad, for the sudden change of adaptation can be dangerous and cause accidents.

THE TIME HAS COME for someone with some time at his disposal, and that nowadays means someone in a big firm, to look into the whole problem of window sizes. In Sweden a Royal Commission has recently reported on this subject. The Swedes were concerned only with heating and lighting, but there are other aspects too, such as traffic noises and the desire for privacy. Traffic noises get through windows more easily than through walls and town planners have noise as well as light in mind when they space buildings well apart and well back from traffic routes. Even so, the dull roar of a great city's traffic will come all too easily through the airspaces in English windows. Some new buildings fitted with sealed-frame windows of double glazing show how much improvement can result; at a cost, admittedly, but what is the cost in productivity of ill-tempereed staff, their nerves jangled by the incessant traffic noise. (Sometimes I marvel that *Light and Lighting* is such a good tempered journal. I should not like to have to bear with the noise of the Victoria Street traffic, as the Editor and his staff needs must). Now I see that sealed double windows are being recommended for hospitals in towns, primarily to cut out traffic noise. This is a move in the right direction, but how long will it be before the idea is put into practice?

THE CHRISTMAS DECORATIONS IN OUR BIG TOWNS get more elaborate while the smallest shopping centre tries to put on some show. Very often good taste and skill succeed where unlimited wealth may fail. The luminous angels in Regent Street have not met with universal approval. The multi-coloured stars in Oxford Street, on the other hand, were just right for a commercial spree and were well done technically as well. Now that town decoration at Christmas is becoming a custom (and long may it continue) could not someone with a real knowledge of lighting offer advice to those who have to supervize the erection of these decorations? In my town it is the Borough Surveyor who has the job, and he in turn passes it on to a little man who knows all about wiring. The result is surprisingly good, but could be better with technical guidance. An IES paper illustrated with really good colour slides would make an entertaining evening.

I WAS ASKED AT A PARTY why it was that my reflection in a mirror was reversed left to right but not upside down. In attempting an answer I persuaded my questioner to lie down horizontally on the floor on his side facing a mirror. This merely advanced the argument without providing any convincing answer. I suspect that there is no proper answer because it is not a proper question. Perhaps one of my readers could draw a diagram for me.

'Lumeritas'

ROTAFLEX (G.B.) LIMITED,
4-10 NILE ST., LONDON, N.1.

Date 1st Feb 61

INTERNAL MEMORANDUM

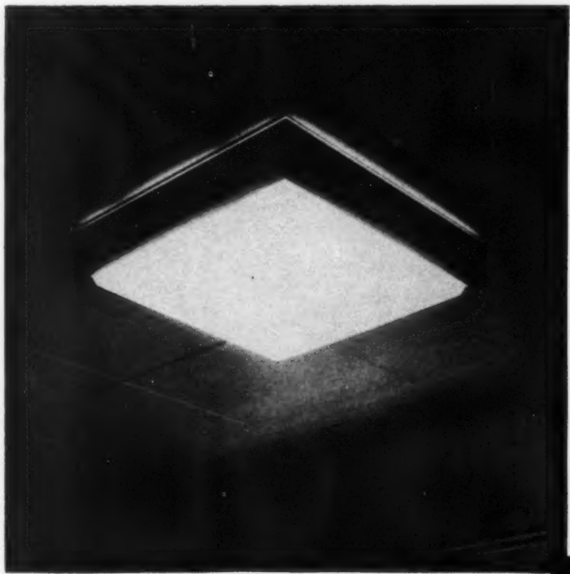
To: Kenneth White Dept.: L.P. DIV. | From: Bernard Stern Dept.:

SUBJECT LIGHTPLAN, (Showroom - 4 Conduit Street W1)

Welcome to our wonderful world of light! You are taking over "LIGHTPLAN", our new division, to give architects, consultants and contractors a complete light-planning service. The new catalogue (150 pages) will soon be ready. We've put years of work into the new fluorescent and incandescent architectural fittings you're going to offer. We're glad to have you with us and we want you to go all out to pass on to the customer the feeling that we love our job! — our "light-planning" job.

Bernard Stern
Chairman

P.S. The catalogue will contain all details of the "Lightolier" fittings we are making here under licence.

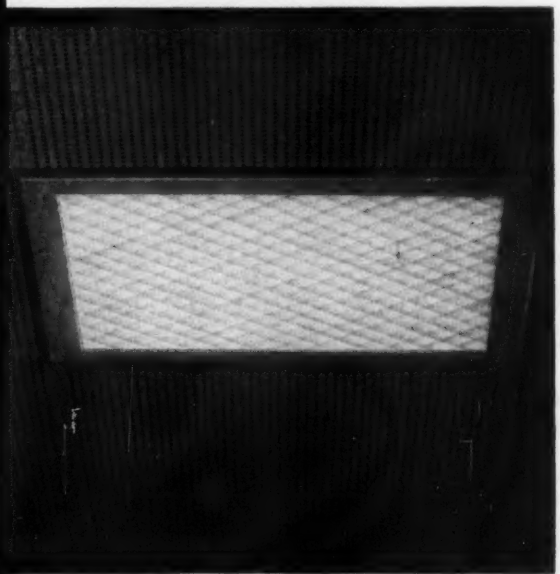


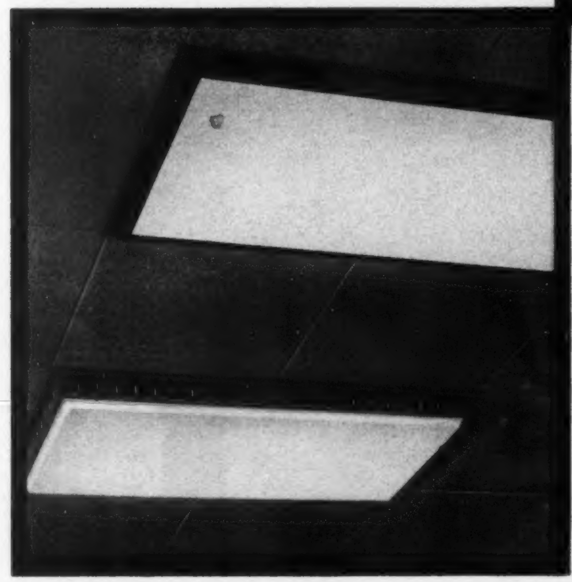
REVO

Revo Surface Modules are designed for fluorescent lighting in low floor to ceiling situations where it is impossible or undesirable either to recess or suspend the lighting fittings. A rim of Perspex is inserted between fitting and ceiling to give an interesting 'halo' effect. Sizes 2′×2′, 2′×4′, 2′×5′, all 4″ deep.

MODULAR

Revo Recessed Modules are designed to fit the 2′×2′ grid in sizes of 2′×2′, 2′×4′, 2′×6′ with fluorescent lamps of 20–80W. Each fitting is suitable for virtually all types of suspended ceilings and provides at the same time a service entry, because the gear tray and lampholders are completely and easily removable for easy maintenance, leaving free entry to the above ceiling services. Overlap or flush bezels are available.





LIGHTING

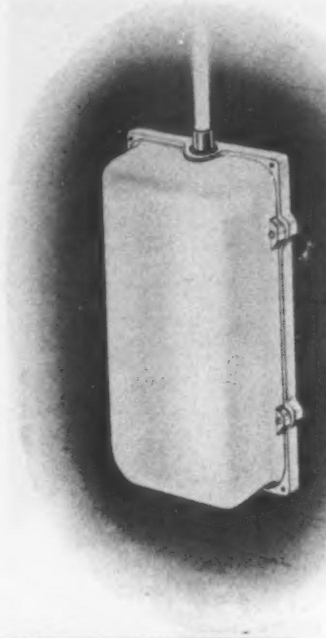
Revo Dropped Frame Modules are an innovation designed to relieve large uninterrupted ceiling areas. Sides may be plain or pierced, with 1″, 2″, or 3″ drops, finished to any of the Architects' Standard Range of colours. All Revo Modular fittings have either opal Perspect diffusers or polystyrene eggcrate louvres.

Literature readily available on request.

REVO ELECTRIC CO. LTD., TIPTON, STAFFORDSHIRE

A Duport Company famous for cookers, fires, fluorescent and industrial light fittings, power tools, street lighting, switch and fusegear, etc.

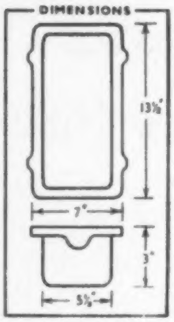
W&W



Major

Weatherproof Triple Tube Fluorescent Bulkhead Fitting

Cat. No. S.3107
(Switch Start only)



Suitable for—

Stairs · Passageways · Garages
Public Conveniences · Warehouses
Telephone Kiosks · Cellars, etc.

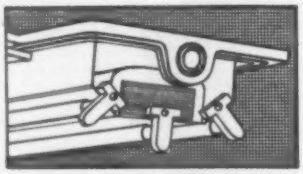
This versatile Bulkhead Fitting is suitable for mounting on either wall or ceiling, for indoors or outside, as required, being dust-tight and weatherproof.

The translucent perspex cover fits on a gasket snugly grooved in the alloy base casting, which carries 3 sets of holders to take the fluorescent tubes each 12"—8w. (see sketch).

The fitting is provided with conduit entry at both ends, and (if stated when ordering) can be arranged to have a back entry to suit a standard B.E.S.A. box.

At present the fitting is made in one size only, to the dimensions shown in sketch (left).

The long life (5,000 hours approx.) fluorescent tubes have the merit of needing only infrequent replacement, which renders the fitting particularly suitable when fixed in inaccessible positions.



The Fitting is designed so that one, two or three tubes can be separately switched for variations of lighting intensity.

(If Fitting is required with only one or two tubes instead of the standard three-tube arrangement, a reduced price will be quoted on application.)

Makers of Fluorescent Fittings, Stage Lighting Equipment

MAJOR EQUIPMENT CO., LTD.
22, GORST ROAD N.W.10 | ELGar 8041 (5 lines)
Depots: Birmingham, Manchester, Coventry, North Shields, Glasgow

---

TRAN ✱ STAR

LIGHTING CONTROL UNITS

PIONEER OF ALL SELF-CONTAINED INSTANT-START BALLASTS

DESIGNED TO ENSURE FULL LAMP LIFE HIGH LUMEN OUTPUT SILENT OPERATION

FITTED WITH HIGH-TEMPERATURE RESISTING CAPACITORS AND

GUARANTEED FOR 3 YEARS

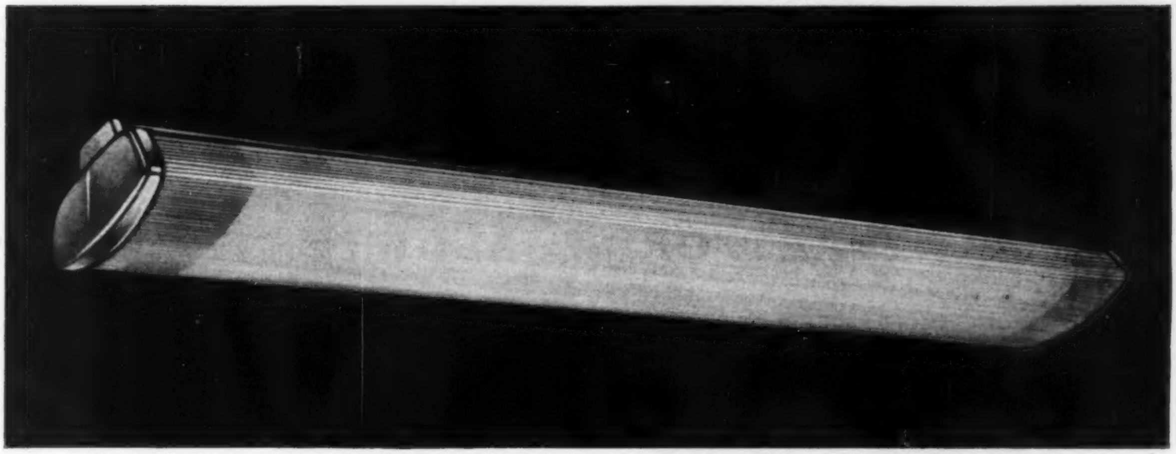
Sole Manufacturers
INDUCTIVE APPLIANCES LTD., ST. NICHOLAS STREET, NEWCASTLE-UPON-TYNE 1

Tel. Newcastle 27069 Works Tel. Hebburn 832221

The idea that transformed fluorescent lighting design

By Appointment to
Her Majesty the Queen
Manufacturers of Electric Lamps
Crompton Parkinson Ltd

'New Range' principles of standardisation and interchangeability, now so widely accepted, have led design for several years. Hundreds of thousands of 'New Range' fittings in use testify to their economy, reliability and durability.



ECONOMY	Minimum power consumed for each size and type.
RELIABILITY	Designed for effective performance under widely varying conditions.
DURABILITY	'Permawhite' enamel for a long unblemished life.
ADAPTABILITY	A multitude of types from so few standard parts.
INSTALLATION	Without extra costs 'New Range' can be installed at any centres to pendants or directly to structure.

CP ELECTRICAL EQUIPMENT

Crompton 'New-Range'

FLUORESCENT LIGHTING FITTINGS

CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON W.C.2.

STRATFORD-in-ALDWYCH

STRAND ELECTRIC

Stratford-in-Aldwych . . . Lighting-by-Strand. The arrival of the Shakespeare Memorial Theatre Company in the West End brings another welcome addition to repertory type lighting layouts. This semi-permanent lighting layout will afford Stratford maximum versatility in their long and varied London programme. This important installation included a new Remote Control board with memory presets, the whole of the lighting equipment and the rewiring of the entire theatre—all by Strand Electric.

THE STRAND ELECTRIC & ENGINEERING CO LTD 29 KING ST. COVENT GARDEN LONDON WC2

INDEX TO ADVERTISERS